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US Army Corps of Engineers®
Engineer Research and Development Center

Airfield Pavement Evaluation, Marshall Army Airfield, Fort Riley, Kansas

Patrick S. McCaffrey, Jr.

December 2002

Geotechnical and Structures Laboratory

Distribution is limited to U.S. Government agencies only; test and evaluation; December 2002. Other requests for this document shall be referred to Headquarters, U.S. Army Corps of Engineers (CECW-EW), Washington, DC 20314-1000.

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Airfield Pavement Evaluation, Marshall Army Airfield, Fort Riley, Kansas

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Final report

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Prepared for U.S. Army Forces Command
Fort McPherson, GA 30330-1062

Contents

Preface

The purpose of this report is to provide an assessment of load-carrying capacity and condition of airfield pavements at Marshall Army Airfield (MAAF), Fort Riley, Kansas. This report provides data for the following:

a. Planning and programming pavement maintenance, repairs, and structural improvements.

b. Designing maintenance, repair, and construction projects.

c. Determining airfield operational capabilities.

d. Providing information for aviation flight publications and mission planning.

Users of information from this report include the installation's Directorate of Installation Support (DIS), engineering design agencies (DIS's, U.S. Army Corps of Engineers), Airfield Commanders, U.S. Army Aeronautical Services Agency, and agencies assigned operations planning responsibilities. Information concerning aircraft inventory, passes, and operations shall not be released outside U.S. Government agencies. This report satisfies requirements for condition inspection and structural evaluation established in Army Regulation AR 420-72 (Headquarters, Department of the Army 2000) and supports airfield survey requirements identified in Army Regulation AR 95-2 (Headquarters, Department of the Army 1990).

The Army Airfield Pavement Evaluation Program is sponsored and technically monitored by the U.S. Army Corps of Engineers, Transportation Systems Center (CENWO-ED-TX), located in Omaha, NE. The U.S. Army Forces Command (AFEN-PR), Fort McPherson, Georgia, provided funding for this investigation.

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Geotechnical and Structures Laboratory (GSL), Vicksburg, MS, prepared this publication. The findings and recommendations presented in this report are based upon pavement structural testing, data analysis, and condition survey work at LAAF. The required field testing was conducted in May 2002. The evaluation team consisted of Messrs. Robert W. Grau, Dan D. Mathews, and Patrick S. McCaffrey, Jr., Airfield and Pavements Branch (APB), GSL.

Mr. McCaffrey prepared this publication under the supervision of Mr. Don R. Alexander, Chief, APB, Dr. Albert J. Bush III, Chief, Engineering Systems and Materials Division, and Dr. David W. Pittman, Acting Director, GSL.

At the time of publication of this report, Dr. James R. Houston was Director of ERDC, and COL John W. Morris III, EN, was Commander and Executive Director.

Recommended changes for improving this publication in content and/or format should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to Headquarters, U.S. Army Corps of Engineers, ATTN: CECW-EWS, 441 G Street NW, Washington, DC 20314.

Executive Summary

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, conducted the field testing at Marshall (MAAF), Fort Riley, Kansas, during May 2002. The structural capacity and physical properties of the pavement facilities were determined from nondestructive tests using a heavy weight deflectometer (HWD) and from measurements taken in previous studies. A visual inspection was also conducted to establish the condition of the airfield surface, which does not necessarily correspond to its load-carrying capacity.

The results of the tests and visual inspection reveal the following:

a. The airfield pavement facilities and their assigned Pavement Classification Number (PCN) are shown in Illustration 1.

b. All of the runway features require structural improvement to withstand day-to-day mission (i.e., peacetime use) for 20 years. Features T8B, A5B, and A9B are structurally adequate to withstand day-to-day mission (i.e., peacetime use) for 20 years. All of the remaining features require structural improvement to withstand the day-to-day mission (i.e., peacetime use) for 20 years.

c. Installation Status Report (ISR) ratings for the airfield are shown in Illustration 2.

d. The PCI's of all runway features (R1A thru R3A), seven of eight taxiway features, and six of nine apron features (A1B thru A4B, A6B, and A8B) fail to meet the minimum acceptable level outlined above. Because of the density and severity of the various distresses observed in these 16 features, maintenance and/or repair is not recommended for upgrading to an acceptable PCI level. Each feature should be reconstructed based on project usage.

e. In planning structural improvements and/or reconstruction requirements, it should be recognized that UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) specifies that the following pavements be rigid pavement: all paved areas on which aircraft or helicopters are regularly parked, maintained, serviced, or preflight checked, on hangar floors and access aprons; on runway ends (305 m (1,000 ft)) of

a Class B runway; primary taxiways for Class B runways; hazardous cargo, power check, compass calibration, warmup, alert, arm/disarm, holding, and washrack pads; and any other area where it can be documented that a flexible pavement will be damaged by jet blast or by spillage of fuel or hydraulic fluid.

f. Overloading the pavement facilities may shorten the life expectancy.

g. In order to be in concurrence with AR 420-72 (Headquarters, Department of the Army 2000), a condition survey of the airfield pavements will be required in 2006 and a structural evaluation including nondestructive testing in 2010.

Additional details on structural capacity, surface condition, and work required to maintain and strengthen the airfield are contained in Chapters 2 and 3 of this report.

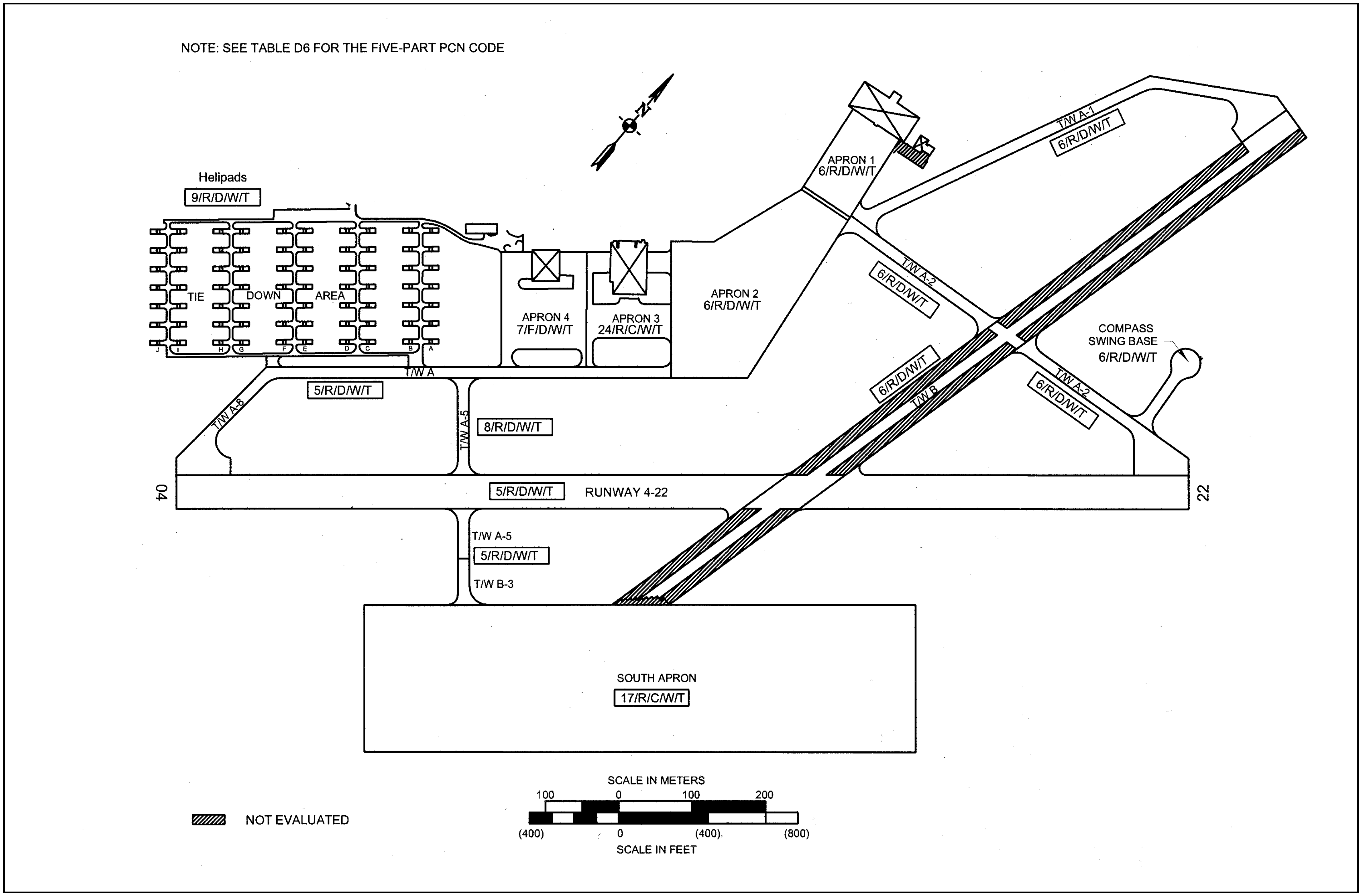

Illustration 1. Airfield Pavement Evaluation Chart (APEC)

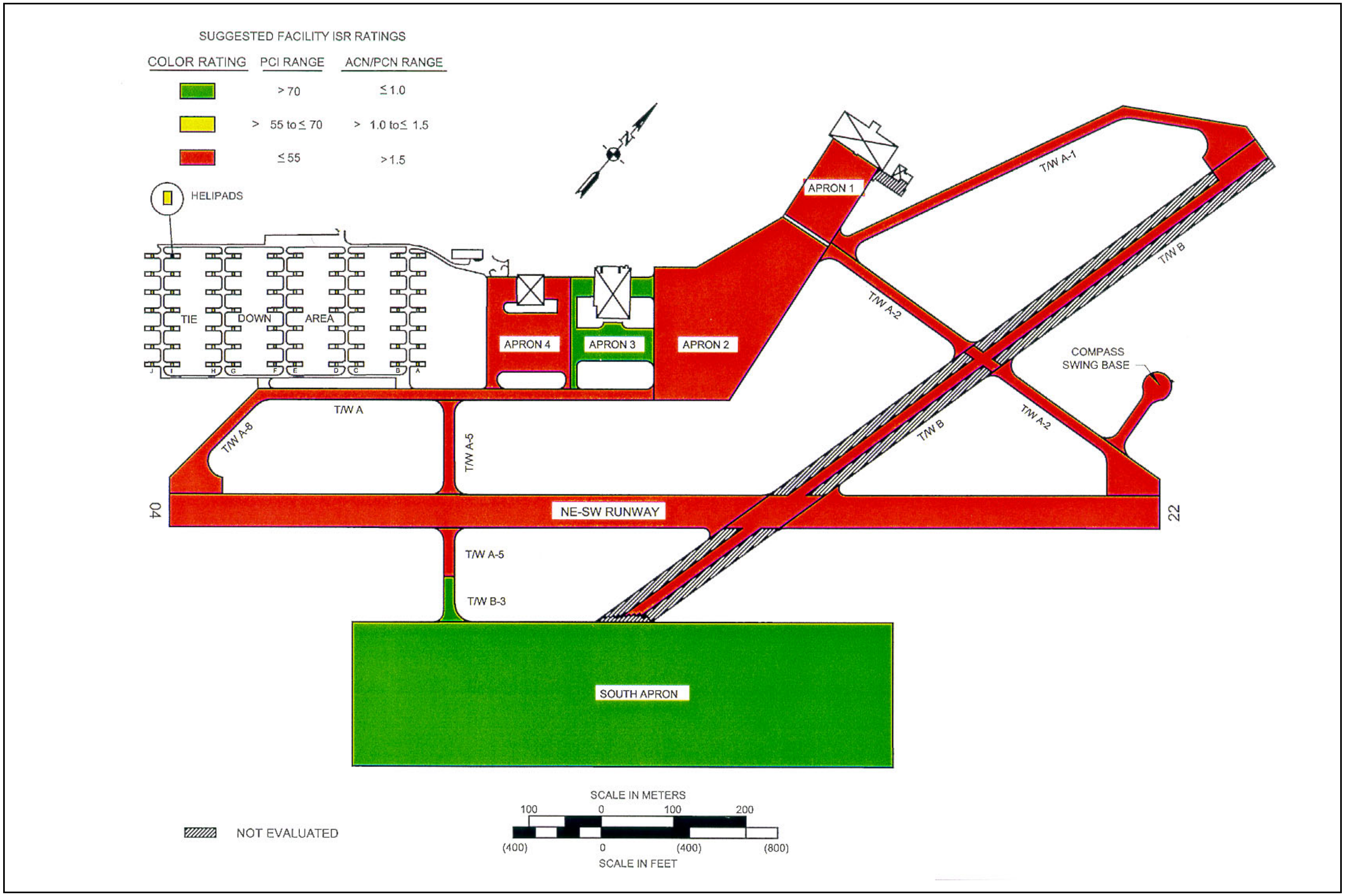

Illustration 2. Airfield pavement ISR ratings

1 Introduction

Background

In May 1982 the Department of the Army initiated a program to determine and evaluate the physical properties, the load-carrying capacity for various aircraft, and the general condition of the pavements at major U.S. Army Airfields (AAFs). This program was established at the request of the Major Army Commands (FORSCOM, TRADOC, and AMC). Headquarters, U.S. Army Corps of Engineers (CECW-EW) sponsors a program for periodic evaluation of Army Airfield facilities in accordance with Army Regulation AR 420-72 (Headquarters, Department of the Army 2000). All Category 1 AAFs and instrumented U.S. Army Heliports (AHPs) are included in the CECW-EW program. The evaluation of the airfield pavements was performed to determine the structural adequacy of the existing pavements to accommodate mission aircraft. Results of this evaluation were also used to identify maintenance, repair, and major repair work requirements and to help establish Installation Status Report (ISR) ratings. The U.S. Army, Forces Command, Fort McPherson, Georgia, provided funding for this investigation. Results of this investigation will provide current information for designing upgrades to the pavement facilities.

Objective and Scope

The primary objectives of this investigation were to determine the allowable aircraft loads and design traffic, and to identify maintenance, repair, and structural improvement needs for each airfield pavement feature. These objectives were accomplished by:

a. Obtaining records of day-to-day traffic operations from the installation Airfield Commander.

b. Conducting a structural evaluation of the airfield pavements in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) using the nondestructive testing device.

c. Performing a condition survey to determine pavement distresses (type, severity and magnitude) in accordance with ASTM D 5340-93 and using analysis features of the Micro PAVER pavement management system.

The results of this study can be used to:

a. Provide preliminary engineering data for pavement design (Appendixes A and B).

b. Assist in identifying and forecasting maintenance and repair work, the preparation of long range work plans, and programming funds for the various work classification categories (Appendixes C and E).

c. Determine type and gross weights of aircraft that can operate on a given airfield feature without causing structural damage or shortening the life of the pavement structure (Appendix D).

d. Determine aircraft operational constraints as a function of pavement strength and surface condition (Appendix D).

e. Determine the need for structural improvements to sustain current levels of aircraft operations (Appendix D).

f. Summarize results for ISR ratings (Executive Summary).

Chapter 2 of this report includes the results of the aircraft classification number-pavement classification number (ACN-PCN) analysis for use by U.S. Army Aeronautical Services Agency (USAASA), the airfield commander, and Deputy Chief of Staff for Operations and Plans (DCSOPS) personnel. Chapter 3 contains maintenance, repair, and structural improvement recommendations for use by DPW personnel and design agencies. Chapter 4 contains conclusions and recommendations in summary form. Detailed supporting data are provided in the appendices.

2 Pavement Load-Carrying Capacity

General

The load-carrying capacity is a function of the strength of the pavement, the gross weight of the aircraft, and the number of applications of the load. The method used to report pavement load-carrying capacity is the ACN-PCN system as adopted by the International Civil Aviation Organization (ICAO). The United States, as a participating member of ICAO, is required to report pavement strength in this format. The ACN-PCN format also provides the airfield evaluation information required by Army Regulation AR 95-2 (Headquarters, Department of the Army 1990).

The ACN and PCN are defined as follows: The ACN is a number which expresses the relative structural effect of an aircraft on both flexible and rigid pavements for specific standard subgrade strengths in terms of a standard single wheel load. The PCN is a number which expresses the relative load-carrying capacity of a pavement for a given pavement life in terms of a standard single wheel load. An example of a PCN five part code is as follows:

25/F/A/W/T

- T: PCN derived from technical evaluation
- W: Tire pressure code W: High tire pressure (no limit)
- A: Subgrade strength A: High (CBR>13)
- F: Pavement type F: Flexible
- 25: PCN = 25: Indication of load-carrying capacity. Example C-130 loaded to 70 Mg (155 kips)[1]

[1] Most of the dimensions and measurements reported were obtained in non-SI units. All such values have been converted using the conversion factors given in ASTM E 380.

The system works by comparing the ACN to the PCN. The PCN is a representation of the allowable load for a specified number of repetitions over the life of a pavement. The ACN is a representation of the load applied by an aircraft using the pavement. The system is structured such that an aircraft operating at an ACN (applied load) equal to or less than the PCN (allowable load) would comply with load restrictions established based on a specified design life for the pavement facility. If, however, the ACN (applied load) is greater than the PCN (allowable load), the specified design life will be shortened due to this overloading. Pavements can usually support some overload; however, pavement life is reduced. As a general rule, ACN/PCN ratios of up to 1.25 have minimal impact on pavement life. If the ACN/PCN ratio is between 1.25 and 1.50, aircraft operations should be limited to 10 passes, and the pavement inspected after each operation. Aircraft operations resulting in an ACN/PCN ratio over 1.50 should not be allowed except for emergencies.

Load-Carrying Capacity

The first step in determining the load-carrying capacity of the pavements at Marshall Army Airfield (MAAF), Fort Riley, Kansas was to estimate the traffic to which the airfield will be subjected over the next 20 years. At the time of the pavement evaluation the airfield was closed to fixed-wing aircraft. The airfield was evaluated as a Class III airfield in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). The traffic mix established for this airfield is shown in Table A4. Based on this mix, the critical aircraft operating on the airfield was determined to be the CH-47 at a design pass level of 14,207 passes as shown in Table D1. Using this traffic information, and results of the data analysis, the ACN values for the critical aircraft operating on the MAAF pavements were determined. These values are designated as the operational ACN. The operational ACN is 11/R/D/W/T for the rigid pavements and 12/F/D/W/T for the flexible pavements. (See Table D5 for description of the five component ACN or PCN code.) The numerical ACN values calculated for the critical aircraft operating on AC and PCC pavements on each of the four subgrade categories are presented in Table D2.

The critical PCN value for each airfield facility is presented in the Airfield Pavement Evaluation Chart (APEC) in Illustration 1. A summary of allowable loads and overlay requirements determined for the critical aircraft and its design pass level is shown in Table D3.

The number of passes of mobilization and contingency aircraft loadings that could be sustained by each facility is dependent on the ACN of the aircraft and the critical PCN of the facility. During wartime, many aircraft are allowed to carry heavier loads than during peacetime. This allowance means that the aircraft would have a higher ACN because of the higher loading and would cause more damage per pass than in peacetime. Also, under some contingency plans or during emergencies, heavier aircraft than those in the traffic table, see Table A4, could be considered for using the airfield pavements. These heavier aircraft would generally have higher ACN values and cause more damage than those normally using the airfield. The operational life of the pavement will be reduced if it is subjected to aircraft loadings having ACN values higher than the PCN of the facility. An example of a procedure to determine the impact of mobilization and contingency aircraft operations is presented in Appendix D.

3 Recommendations for Maintenance, Repair, and Structural Improvements

General

Recommendations for maintenance, repair, and structural improvements are based on results from both the structural evaluation (Appendix D) and the pavement condition survey (Appendix C). Either or both the evaluation and/or the survey may indicate that a particular feature needs repair and/or improvement. If the pavement condition index (PCI) is below the required value contained in Army Regulation AR 420-72 (Headquarters, Department of the Army 2000), the pavement needs maintenance to improve its surface condition. If the ACN/ PCN ratio determined for the critical aircraft is greater than one, the pavement needs structural improvement. Where both evaluations indicate improvements are needed, the recommendations are made such that the repairs to the surface are those needed until the structural improvements can be made. If the structural improvements are made first, the surface repairs may not be necessary. The PCI, ACN/PCN, ISR rating, and recommended general maintenance alternatives for each feature are shown in Table 3-1, the Airfield Pavement Evaluation General Summary. Specific recommendations for maintenance are identified in Table 3-2.

The ISR is an information system designed to help the Army monitor some of the basic elements that affect the quality of life on installations. The ISR also supports decision-making by giving managers an objective means and a common methodology for comparing conditions across installations and across functional areas.

Recommendations for structural improvements have been defined in terms of overlays in this report. In some instances, overlays may not be the most cost effective or best engineering alternative for pavement strengthening. It should be noted that the overlay requirements shown in Table 3-2 were determined based on representative conditions at the time of testing and should be considered minimum values until verified by further investigation. These overlays should be used as a guide when programming funds for design projects. Prior to advertising an improvement project, a thorough pavement analysis and design should be completed to select the most cost-effective improvement technique. All designs should be reviewed by the U.S. Army Corps of Engineers Transportation Systems Center to ensure that they are in accordance with current design criteria.

Recommended overlay thicknesses follow the criteria for minimum thicknesses contained in UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). Where calculated thicknesses are greater than the required minimum thickness, the values were rounded up to the next higher 13 mm (1/2-in.).

Maintenance and repair (M&R) recommendations are based on the changes needed to provide the minimum required PCI. AR 420-72 (Headquarters, Department of the Army 2000) states that installation airfield pavements shall be maintained to at least the following PCI:

All runways > 70
Primary taxiways ≥ 60
Aprons and secondary taxiways > 55

Recommendations

Steps 1 through 5 of the flow chart shown in Figure 3-1 were used in determining the recommendations suggested in Table 3-2. The M&R alternatives suggested for the existing surfaces were selected from those listed for various distresses in flexible and rigid pavements shown in Table 3-3 and 3-4, respectively. In many instances, the performance of a specific alternative depends upon the geographical location and expertise of local contractors. Therefore, it is suggested that the local DIS personnel review all recommendations. Local costs for the approved alternatives can then be used with the Micro PAVER program to obtain a reasonable cost estimate. All overlay, repair, or major repair should be in accordance with UFC 3-269-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) that specifies that the following pavements be rigid pavement: all paved areas on which aircraft or helicopters are regularly parked, maintained, serviced, or preflight checked, on hangar floors and access aprons; on runway ends (305 m (1,000 ft)) of a Class B runway; primary taxiways for Class B runways; hazardous cargo, power check, compass calibration, warmup, alert, arm/disarm, holding, and washrack pads; and any other area where it can be documented that a flexible pavement will be damaged by jet blast or by spillage of fuel or hydraulic fluid.

The PCI was developed to determine maintenance and repair needs. If the PCI is low, maintenance or repair is needed to increase the PCI. If the PCI is low and the PCN is greater than the ACN, localized maintenance or repair will generally be an acceptable solution. Although these maintenance activities and repairs will improve the PCI to acceptable levels, they may not be the most cost-effective alternative. An overlay or other overall improvement may be more cost-effective than considerable localized maintenance or repairs. Certainly, if the current PCI is less than 25, overall improvements should be investigated. When an overlay is recommended, the maintenance recommended is that which is needed to keep the pavement serviceable and safe and its PCI at the required minimum until the overlay is applied. The PCN is used to specify the structural capability of an airfield pavement. If the design aircraft's ACN is larger than the computed PCN, the pavement is structurally inadequate to support the mission traffic. If only repairs to improve the PCI are applied, the pavement could deteriorate quite rapidly. Structural improvements are required to increase the load-carrying capacity so that the PCN is greater than or equal to the ACN (aircraft load). Even if the PCI is high, structural improvements are necessary to support the mission traffic if the PCN is less than the design ACN.

The PCI's of all runway features (R1A thru R3A), seven of eight taxiway features, and six of nine apron features (A1B thru A4B, A6B, and A8B) fail to meet the minimum acceptable level outlined above. Because of the density and severity of the various distresses observed in these sixteen features, maintenance and/or repair is not recommended for upgrading to an acceptable PCI level. Each feature should be reconstructed based on projected usage.

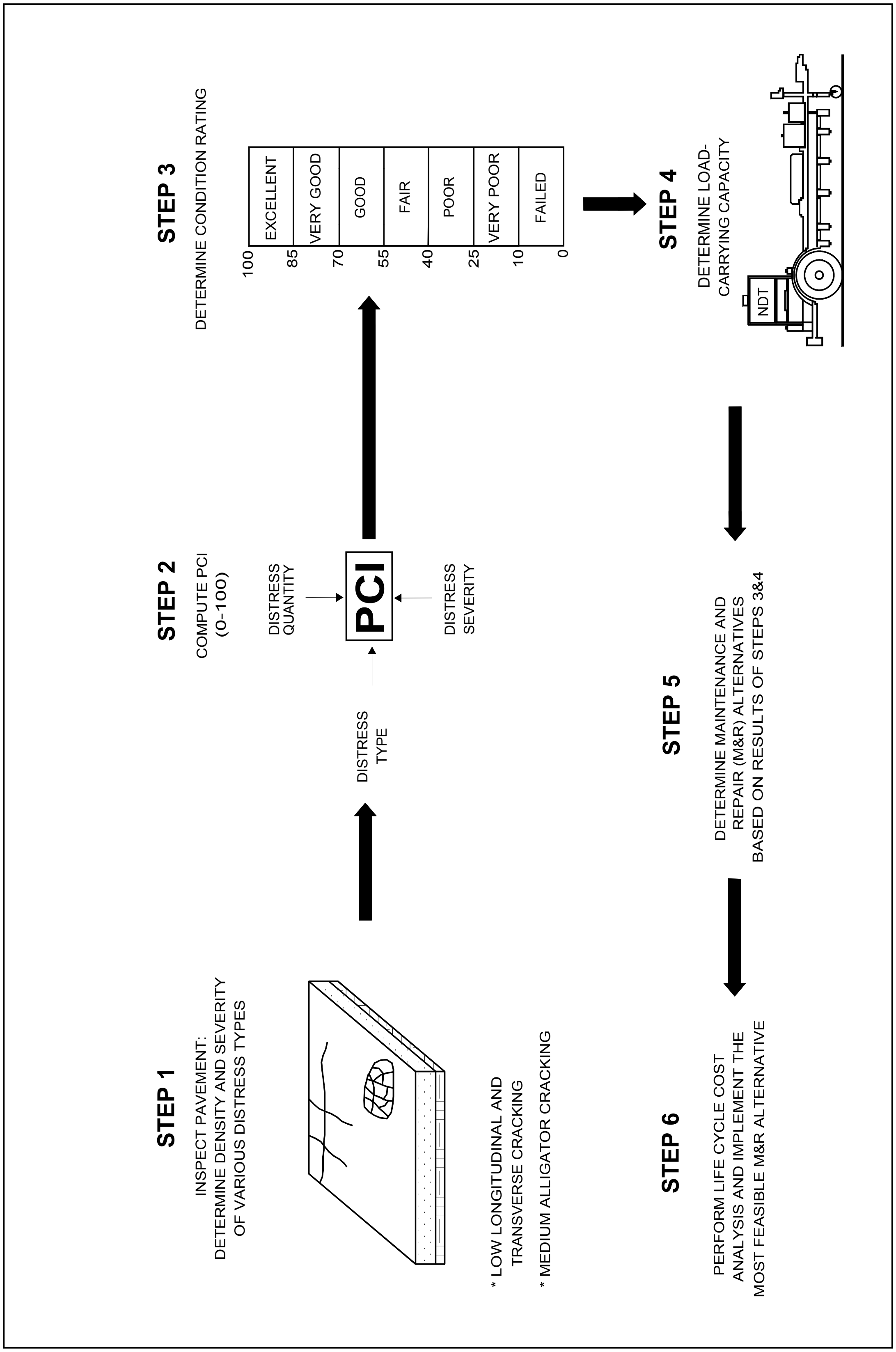

Figure 3-1. Flowchart for determination of maintenance and repair recommendations

Table 3-1
Airfield Pavement Evaluation General Summary

Pavement Feature	PCI	ACN/ PCN[2]	ISR Rating[3]	Work Classification[1]: Do Nothing	Maintenance	Repair	Major Repair
R1A	34	1.83	Red			X	
R2A	20	2.20	Red				X
R3A	15	1.83	Red				X
T1B	13	2.20	Red				X
T2B	31	1.38	Red			X	
T3A	16	2.20	Red				X
T4A	30	1.83	Red			X	
T5A	3	1.83	Red				X
T6B	14	1.83	Red				X
T7B	8	2.20	Red				X
T8B	99	0.65	Green	X			
A1B	18	1.57	Red				X
A2B	30	1.83	Red			X	
A3B	40	1.83	Red			X	
A4B	32	1.83	Red			X	
A5B	89	0.46	Green	X			
A6B	10	1.71	Red				X
A7B	76	1.22	Yellow			X	
A8B	14	1.83	Red				X
A9B	96	0.69	Green	X			

[1] Work is categorized for preliminary planning purposes only. Classification of work for administrative approval is an installation responsibility. Policy guidance for airfield pavements is provided in AR 420-72. *Maintenance* is usually performed on paved areas with a PCI greater than the minimum required and encompasses primarily the day-to-day routine work. Maintenance includes items such as sealing cracks and joints, repairing potholes, patching, repairing spalls, and applying rejuvenators. *Repair* is the restoration of a failed or rapidly deteriorating section of pavement to a good or excellent condition to such that it may be utilized for its designated purpose. Repair is usually applied to pavements with a PCI less than the minimum required. Examples are: recycling, overlays, slab replacement, and repairing drainage structures. *Major repair (construction)* relates to the alteration, extension, replacement, or upgrading of an existing facility. Major repair examples include: widening or lengthening a surfaced area, strengthening a pavement to support a new mission, and replacement of an entire facility.
[2] Determined for design aircraft.
[3] Based on the PCI and ACN/PCN ratio of the pavement feature.

Table 3-2
Summary of Overlay and Maintenance Requirements for the Day-to-Day Traffic Operations

Feature	Area, m^2 (yd^2)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with No Bond	Maintenance and Repair Alternatives for Existing Surfaces
Runway 4-22					
R1A	13 889 (16,667)	343 (13.5)	191 (7.5)	216 (8.5)	The PCI of this feature is below that required for runways and it is structurally inadequate to support the design traffic. Crack sealing and/or patching is not recommended. PCC reconstruction or rubblizing existing PCC and overlay with AC is recommended if this feature is to withstand the projected traffic.
R2A	32 748 (39,167)	394 (15.5)	203 (8.0)	216 (8.5)	Same as R1A.
R3A	13 889 (16,667)	381 (15.0)	203 (8.0)	216 (8.5)	Same as R1A.
Taxiway A-5					
T1B	1021 (1,222)	406 (16.0)	203 (8.0)	216 (8.5)	The PCI of this feature is below that required for taxiways and it is structurally inadequate to support the design traffic. Crack sealing and/or patching is not recommended. PCC reconstruction or rubblizing existing PCC and overlay with AC is recommended if this feature is to withstand the projected traffic.
T2C	1970 (2,256)	216 (8.5)	140 (5.5)	165 (6.5)	Same as T1B.
Taxiway A					
T3A[2]	13 096 (15,663)	343 (13.5)	191 (7.5)	216 (8.5)	The PCI of this feature is below that required for taxiways and it is structurally inadequate to support the design traffic. Crack sealing and/or patching is not recommended. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
Taxiway A-2					
T4A[2]	6755 (8,079)	343 (13.5)	191 (7.5)	216 (8.5)	Same as T3A.
T5A	3716 (4,444)	381 (15.0)	203 (8.0)	216 (8.5)	Same as T1B.
Taxiway A-1					
T6A	11 984 (14,333)	368 (14.5)	203 (8.0)	216 (8.5)	Same as T1B.
Taxiway B					
T7B	20 471 (24,484)	394 (15.5)	203 (8.0)	216 (8.5)	Same as T1B.
Taxiway B-3					
T8B	949 (1,133)	0 (0.0)	0 (0.0)	0 (0.0)	None required.

(Sheet 1 of 2)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) requires that the surface be concrete.

Table 3-2 (Concluded)

Feature	Area, m^2 (yd^2)	Overlay Requirements, mm (in.)[1]			Maintenance and Repair Alternatives for Existing Surfaces
		AC	PCC Partial Bond	PCC with No Bond	
Apron 1					
A1B[2]	2809 (3,360)	NA	165 (6.5)	178 (7.0)	The PCI of this feature is below that required for aprons and it is structurally inadequate to support the design traffic. Crack sealing and/or patching is not recommended. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
A2B[2]	6488 (7,760)	NA	191 (7.5)	216 (8.5)	Same as for A1B.
Apron 2					
A3B[2]	20 737 (24,801)	NA	165 (6.5)	203 (8.0)	Same as for A1B.
A4B[2]	16 164 (19,332)	NA	191 (7.5)	203 (8.0)	Same as for A1B.
Apron 3					
A5B[2]	7155 (8,557)	NA	0.0	0.0	None required.
Apron 4					
A6B[2]	8405 (10,054)	51 (2.0)	NA	See[4]	The PCI of this feature is below that required for aprons and it is structurally inadequate to support the design traffic. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
Tie Down Area Pads					
A7B[2]	1625 (1,944)	NA	152 (6.0)	152 (6.0)	The PCI of this feature is above that required for aprons. However, it is recommended that all cracks be cleaned and sealed with a high-quality sealer.[4] Structural improvements are required.
Compass Swing Base					
A8B[2]	2675 (3,200)	NA	203 (8.0)	216 (8.5)	Same as for A1B.
South Ramp					
A9B[2]	148 774 (177,937)	NA	0.0	0.0	None required.

(Sheet 2 of 2)

1 For planning purposes only.
2 UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) requires that the surface be concrete.
3 Was not calculated because feature was evaluated as a flexible pavement.
4 See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-3
Maintenance, Repair, and Major Repair Alternatives for Airfield Pavements, Flexible

	Maintenance				Repair												Major Repair		
Distress Type	Seal Minor Cracks	Repair Pot-Holes	Partial-Depth Patching	Apply Rejuvenators[1]	Seal Major Cracks	Full-Depth Patching	Micro-Surfacing	Slurry Seal[2]	Thin AC Overlays[3]	Surface Milling	Grooving	Porous Friction Course	Repair Drainage Facilities[4]	Surface Recycling	AC Structural Overlay[3]	PCC Structural Overlay	Remove Existing Surface and Reconstruct	Hot Recycle	Cold Recycle
Alligator cracking	L	M,H	M			M,H	L	L					L,M,H		M,H	M,H	H		
Bleeding										A				A			A	A	A
Block cracking	L,M			L	M,H		L,M	L						M	M,H			M,H	M,H
Corrugation			L,M			L,M,H	L,M		M,H	L,M							M,H		
Depression			L,M,H			M,H	L		M,H				L,M,H				H		
Jet blast				A		A	A		A										
Reflection cracking	L,M				M,H		L,M	L							M,H			H	
Longitudinal and transverse cracking	L,M				M,H		L,M	L							M,H			H	
Oil spillage			A			A			A	A				A			A	A	
Patching	L,M		M		M	M,H									M,H		H	H	
Polished aggregate							A	A	A	A	A	A		A					
Raveling/weathering		M,H		L,M		M	L,M	L	M,H	M				M,H		H	H	M,H	
Rutting			L,M			L,M,H	L						L,M,H		M,H	H	H	M,H	
Shoving			L			L,M				L,M							M,H	M,H	
Slippage cracking	A		A		A	A									A		A	A	
Swell			L,M			M,H				L,M			L,M,H				H		

Note: L = low severity level; M = medium severity level; H = high severity level; A = no severity levels for this distress.
[1] Not to be used on high speed areas due to increased skid potential.
[2] Not to be used on heavy traffic areas.
[3] Patch distressed areas prior to overlay.
[4] Drainage facilities to be repaired as needed.

Table 3-4
Maintenance, Repair, and Major Repair Alternatives for Airfield Pavements, Rigid

	Maintenance				Repair											Major Repair	
Distress Type	Seal Minor Cracks	Joint Seal	Partial Patch	Epoxy Patch	Seal Major Cracks	Full-Depth Patch	Under Sealing	Slab Grinding	Surface Milling	AC Overlay	PCC Overlay	Slab Replacement	Crack & Seat with AC Structural Overlay	AC Overlay w/ Geotextile	Repair/ Install Surface/ Subsurface Drainage System[1]	PCC Recycling	Remove Existing PCC and Reconstruct
Blowup			L,M			M,H						H					
Corner break	L			M,H	M,H	M,H						H					
Longitudinal/ Transverse/ Diagonal cracking	L,M				M,H					H	H	H	M,H	H	L,M,H	H	H
D cracking	L		M,H		M,H	H						H				H	H
Joint seal damage		M,H															
Patching (small) <5 ft[2]	L,M		M	L,M	M,H	M,H						H					
Patching/utility cut	L,M		M	L,M	M,H	M,H						H					H
Popouts[2]				A						A	A						
Pumping	A	A			A		A								A		
Scaling/map cracking			M,H					M,H		M,H	M,H						
Fault/settlement		L,M					M,H	L,M	M,H						L,M,H		
Shattered slab	L				L,M					M,H	M,H	M,H		H	L,M,H	H	H
Shrinkage crack[3]																	
Spalling (joints)		L	L,M	L,M,H	M,H	M,H											
Spalling (corner)			L,M	L,M	M,H	M,H											

Note: L = low severity level; M = medium severity level; H = high severity level; A = no severity levels for this distress.

[1] Drainage facilities to be repaired as needed.

[2] Popouts normally do not require maintenance.

[3] Shrinkage cracks normally do not require maintenance.

Table 3-5
Airfield Pavements M&R Cost Estimating Guide

Item	Description	U/M	Unit Cost ($) FY00	FY01	FY02	FY03	FY04	FY05
1	Remove/replace 10 in. PCC w/14 in. PCC including 6 in. base	SY	71.32	73.10	74.92	76.80	78.71	80.68
2	PCC Construction	SY-IN	3.64	3.73	3.87	3.92	4.02	4.12
3	Remove/replace 6 in. Bituminous Pavement w/14 in. PCC including 6 in. base	SY	65.38	67.01	68.69	70.41	72.17	73.97
4	Asphalt Concrete Overlay							
	-- Airfield Mix	TONS	50.34	51.60	52.89	54.21	55.57	56.95
		SY-IN	2.14	2.20	2.27	2.33	2.40	2.48
	-- Highway Mix	TONS	46.36	47.52	48.71	49.92	51.17	52.45
		SY-IN	2.52	2.58	2.65	2.71	2.78	2.85
5	Joint Resealing (JFR)	LF	2.14	2.19	2.25	2.30	2.36	2.42
6	Joint Resealing (NON - JFR)	LF	1.90	1.95	2.00	2.05	2.10	2.15
7	Crack Routing/Sealing (PCC)	LF	2.63	2.70	2.76	2.83	2.90	2.97
8	Neoprene Compression Joint Seal							
	-- Saw Cutting Only	LF	1.33	1.36	1.40	1.43	1.47	1.50
	-- Lubrication, Furnish and Install Compression Seal							
	-- 1/2-in. wide joint	LF	3.30	3.38	3.47	3.55	3.64	3.73
	-- 5/8-in. wide joint	LF	3.66	3.75	3.85	3.94	4.04	4.14
	-- 3/4-in. wide joint	LF	4.49	4.60	4.72	4.84	4.96	5.09
9	Spall Repairs (Epoxy-Bonded PCC)	SF	25.30	25.93	26.58	27.25	27.93	28.63
10	PCC Pavement Removal (To Base Course) T < 12 in.	SY-IN	1.01	1.04	1.06	1.09	1.12	1.15
11	PCC Pavement Removal (To Base Course) T > 12 in.	SY-IN	1.39	1.46	1.50	1.53	1.57	1.61
12	Asphalt Pavement Removal (to base course)	SY-IN	0.92	0.94	0.97	0.99	1.01	1.04
13	Base/Subgrade Removal	SY-IN	0.61	0.63	0.64	0.66	0.66	0.69
14	Asphalt Milling/Profiling/Grinding (Cold)							
	-- up to 1-in. depth	SY	1.56	1.60	1.64	1.68	1.72	1.77
	-- up to 2-in. depth	SY	2.26	2.32	2.37	2.43	2.49	2.55
	-- up to 3-in. depth	SY	2.38	2.44	2.50	2.56	2.62	2.69
	-- up to 4-in. depth	SY	2.50	2.56	2.63	2.69	2.76	2.83
	-- small difficult jobs (hard agg. etc.)	SY-IN	2.97	3.04	3.12	3.20	3.28	3.36
15	PC Concrete Grinding/Profiling (Normally 1/2 in. is max Feasible)	SY-IN	19.02	19.50	19.98	20.48	20.99	21.52
16	Heater-Scarification (3/4—in.) – rejuvenation	SY	1.32	1.35	1.39	1.42	1.46	1.49
17	Cold Recycling 6 in. AC with 4-in.-thick AC O/L	SY	17.46	17.90	18.34	18.80	19.27	19.75
18	Slurry Seal	SY	1.57	1.61	1.65	1.69	1.73	1.78

(Continued)

Table 3-5 (Concluded)

Item	Description	U/M	Unit Cost ($)					
			FY00	FY01	FY02	FY03	FY04	FY05
19	Micro-Surfacing	SY	2.26	2.32	2.37	2.43	2.49	2.55
20	Single Bituminous Surface Treatment	SY	1.90	1.95	2.00	2.05	2.10	2.15
21	Double Bituminous Surface Treatment	SY	2.75	2.82	2.89	2.96	3.03	3.11
22	Rubberized Coal Tar Pitch Emulsion Sand Slurry Surface Treatment	SY	1.72	1.76	1.81	1.85	1.90	1.94
23	Rubberized Coal Tar Pitch Emulsion (No Aggregate)	SY	1.13	1.16	1.19	1.22	1.25	1.28
24	Fog Seal	SY	0.77	0.79	0.81	0.83	0.85	0.87
25	Rubberized Asphalt Systems							
	-- Stress Absorbing Membrane (SAM) Interlayer	SY	4.40	4.51	4.62	4.74	4.86	4.98
	-- SAM Seal Coat (uncoated chips)	SY	4.64	4.76	4.87	5.00	5.13	5.25
	-- SAM Seal Coat (precoated chips)	SY	4.99	5.11	5.24	5.37	5.50	5.64
26	Reinforcing Fabric Membranes (including tack coat)	SY	2.47	2.53	2.60	2.66	2.73	2.79
27	Elastomeric Inlay installed in Existing PCC, Complete (2 ft Wide X 100 ft Long X 2 in. Deep)	EA	25.0K	25.6K	26.3K	26.9K	27.6K	28.3K
28	PC Concrete Inlay (20 ft X 120 ft X 12 in. in Asphalt Pavement)	EA	17.8K	18.2K	18.7K	19.2K	19.7K	20.2K
29	Runway Grooving							
	-- Asphalt Concrete Pavement	SY	1.90	1.95	2.00	2.05	2.10	2.15
	-- Portland Concrete Pavement	SY	4.16	4.26	4.37	4.48	4.59	4.71
30	Runway Rubber Removal (High Pressure Water Blasting Method)	SF	0.059	0.060	0.062	0.063	0.065	0.066
31	Paint Removal							
	-- Partial Removal (Remove only loose, flaking, or poorly bonded paint)	SF	0.059	0.060	0.062	0.063	0.065	0.066
	-- Complete Removal (Using High Pressure water with sand injection)	SF	0.69	0.70	0.72	0.74	0.76	0.78
32	Airfield Marking							
	-- Reflectorized	SF	0.46	0.47	0.48	0.50	0.51	0.53
	-- Non-Reflectorized	SF	0.26	0.27	0.27	0.28	0.29	0.29
33	Street Marking							
	-- Reflectorized	SF	0.33	0.34	0.35	0.36	0.37	0.38
	-- Non-Reflectorized	SF	0.21	0.22	0.22	0.23	0.24	0.24
34	Random Slab Replacement							
	-- 12 ft by 12 ft by 12-in. thick	EA	1.2K	1.2K	1.3K	1.3K	1.3K	1.4K
	-- 25 ft by 25 ft by 12-in. thick	EA	4.8K	4.9K	5.0K	5.2K	5.3K	5.5K
	-- 25 ft by 25 ft by 18-in. thick	EA	7.1K	7.3K	7.5K	7.6K	7.8K	8.0K
	-- 25 ft by 25 ft slab	SY-IN	5.56	5.70	5.84	5.99	6.14	6.29
35	Soil Cement Stabilization (10 percent by weight)	SY-IN	0.50	0.51	0.53	0.54	0.55	0.57

4 Conclusions

The maintenance and rehabilitation alternatives discussed in Chapter 3 and summarized in Table 3-2 should be performed as soon as possible to retain the full benefit of the structural capacity of the existing pavements. The M & R alternatives suggested for the existing surfaces were selected from the alternatives listed for the various distresses shown in Tables 3-3. In many instances the performance of a specific alternative is dependent upon local conditions and contractors.

The operational ACN for the airfield rigid pavement facilities is 11/R/D/W/T and for the flexible pavement facilities 12/F/D/W/T. PCNs for each facility are shown in Illustration 1. ISR ratings based on the ACN/PCN ratios and the PCIs of each respective facility are shown in Illustration 2. The PCI of each feature is summarized in Table 3-1.

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Appendix A
Background Data

Description of the Airfield

MAAF is located on Fort Riley, Kansas, approximately 4.8 km (3 miles) northeast of Junction City, KS, in Geary County. The airfield is located in the Great Plains Province and is situated in the floodplain of the Kansas River. The surface soils are alluvial deposits consisting of silty clays (CL) and sandy silt (ML) and ML-CL type soils. Natural drainage in the area is poor.

The elevation of the airfield is 324 m (1,065 ft) above mean sea level. The climatological data used herein were obtained from the U.S. Air Force Combat Climatology Center (AFCCC) Ashville, NC, from data collected at the weather station at Fort Riley, Kansas. Temperature and precipitation data are summarized in Table A1. These data reflect an average annual temperature of 13^{o}C (56^{o}F) with the maximum and minimum temperature of 44^{o}C and -31^{o}C (112^{o}F and -23^{o}F), respectively. The annual rainfall in the area is about 843 mm (33.2 in.).

A layout of the airfield pavements is shown in Figure A1. Pavement feature identifications and locations are shown in Figure A2. In May 2002 the airfield consisted of a NE-SW runway (4-22), which was 1372 m (4,500 ft) long and 46 m (150 ft) wide; Taxiway B (formerly Runway 18-36), connecting taxiways; a compass swing base, helipads; and five parking aprons.

Previous Reports

Pertinent data for use in this evaluation were extracted from the previous reports listed below:

a. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Evaluation, Marshall Army Airfield, Fort Riley, Kansas," Miscellaneous Paper GL-94-40, September 1994, Vicksburg, MS.

b. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Condition Survey, Marshall Army Airfield, Fort Riley Kansas" Miscellaneous Paper GL-88-22, July 1988, Vicksburg, MS.

c. U.S. Army Engineer Waterways Experiment Station, “Airfield Pavement Evaluation, Marshall Army Airfield, Fort Riley, Kansas,” Miscellaneous Paper GL-85-10, May 1985, Vicksburg, MS.

d. U.S. Army, Kansas City District, CE, “Airfield Evaluation Report, Marshall Army Airfield, Fort Riley, Kansas,” June 1970, Kansas City, MO.

e. U.S. Army, Kansas City District, CE, “Airfield Evaluation, Marshall Army Airfield, Fort Riley, Kansas,” June 1964, Kansas City, MO.

f. U.S. Army, Ohio River Division, CE, “ Airfield Evaluation Report, Marshall Army Airfield, Fort Riley, Kansas,” January 1958, Mariemont, OH.

g. U.S. Army, Missouri River Division, CE, “Airfield Evaluation Report, Marshall Army Airfield, Fort Riley, Kansas,” June 1945, Omaha, NE.

Design and Construction History

The original pavements at MAAF were constructed in 1940. Upgrading of the pavements including new construction or strengthening of the existing facilities was performed during the period 1941 through 2000. Design loads for the pavements prior to 1942 is not known. Runway 4-22, Taxiways A-5, A, A-2, Apron 2 (A3B), and the Compass Swing Base (constructed in 1942) were designed for a gross aircraft load of 13 900 kg (30,000 lb). Aprons 3 and 4 (constructed in 1957 through 1959) were designed for a gross load of 21 800 kg (48,000 lb). Figure A2 presents a layout of the airfield facilities showing the locations of the various pavement features. Table A2 presents the history of the major construction activities at MAAF. Table A3 contains a summary of the physical property data of the various features.

The major construction projects at LAAF are summarized as follows:

a. *1940-1942 construction*. Facilities constructed during this period included Runway 18-36 (R1A thru R3A), Taxiway A-5 (T1B and T2C), Taxiway A (T3A), Taxiway A-2 (T4A and T5A), Taxiway A-1 (T5A), Taxiway A-1 (T6A), Taxiway B (T7A), Apron 1 (A1B and A2B), Apron 2 (A3B and A4B), and the Compass Swing Base (A8B). Construction consisted of 102 mm (6.0 in.) of portland cement concrete (PCC) over the subgrade.

b. *1957-1959 construction*. Facilities constructed during this period included Apron 3 (A5B) and Apron 4 (A6B). Construction of A5B and A6B consisted of 102 mm (6.0 in.) of portland cement concrete and 102 mm (4.0 in) of AC over 486 mm (19.0 in.) of crushed stone base, respectively.

c. *1965 construction*. In 1965, 70 parking pads (A7B) were constructed of 203 mm (8.0 in.) PCC.

d. *1989 construction*. The South Apron (A9B) and Taxiway B-3 (T8B) were constructed during this period. Construction consisted of 203 mm (8.0 in.) of portland cement concrete (PCC) over 102 mm (4.0 in) crushed stone base.

e. *1989 maintenance*. A slurry seal was applied to Runway 4-22 (R1A, R2A, and R3A) during this period.

f. *2000 maintenance*. A joint seal project and spall repair was applied to the South Apron (A9B). The cracks were sealed and a joint seal project was applied to Apron 1 (A1B and A2B).

Traffic History

At the time of the pavement evaluation the airfield was closed to fixed-wing aircraft. Currently utilizing the facilities are rotary-wing aircraft. The airfield was evaluated as a Class III airfield in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). A Class III airfield is evaluated for the C-23 and CH-47 aircraft, as shown in Table A4.

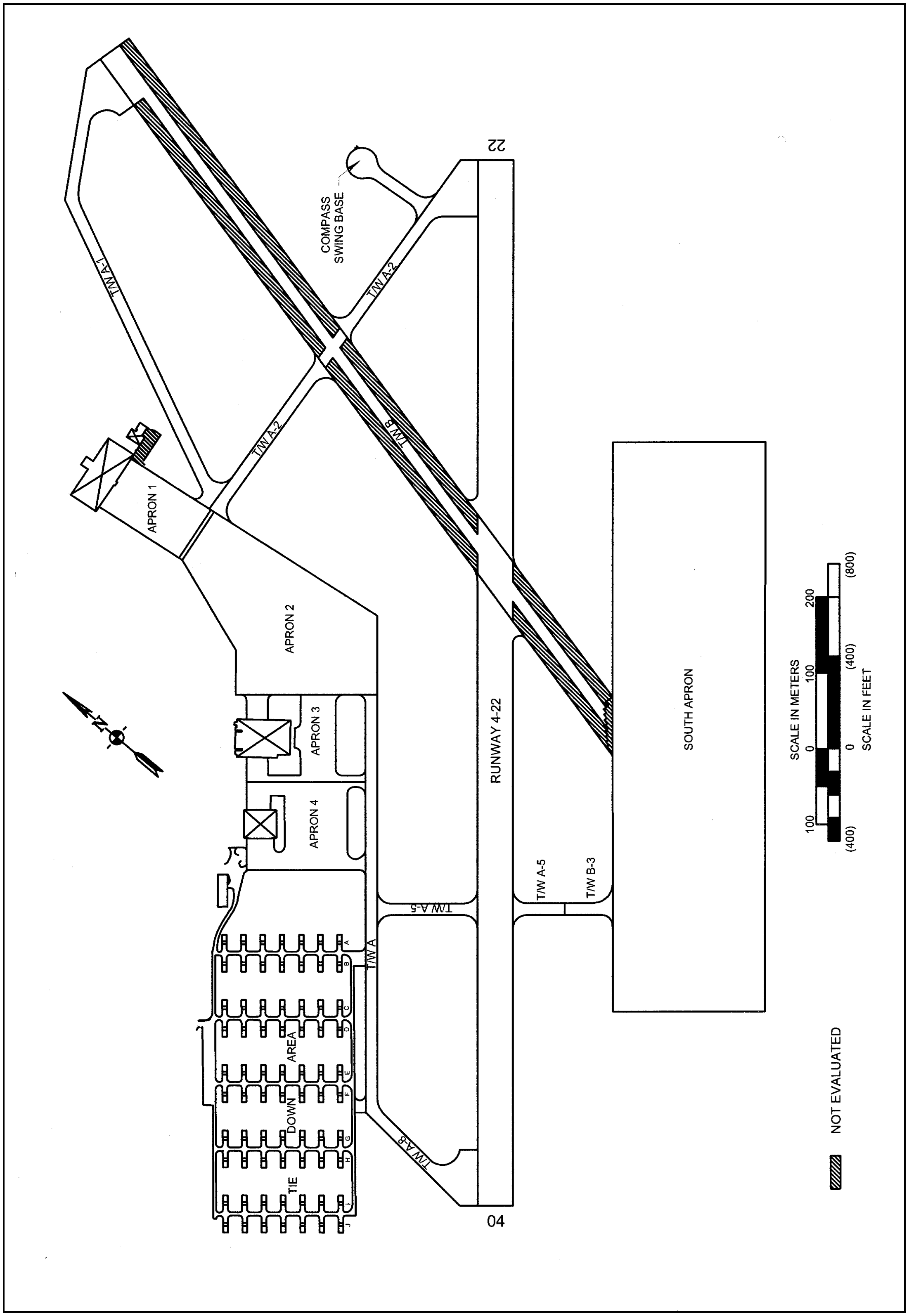

Figure A1. Layout of airfield and facility identifications

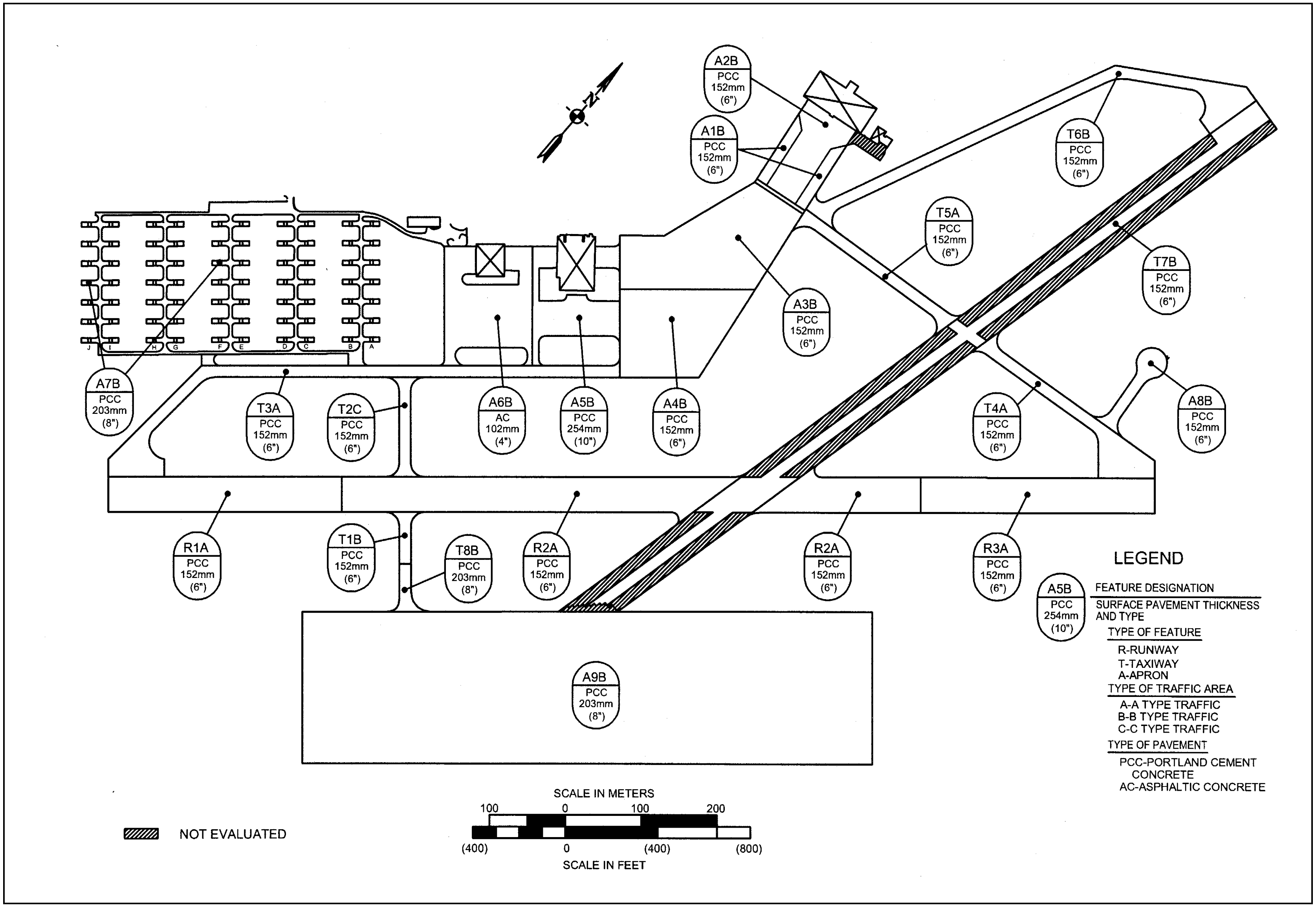

Figure A2. Pavement feature identification and location

Table A1
Climatological Data Summary

	J	F	M	A	M	J	J	A	S	O	N	D	ANN	YRS REC
Temperature, °C (°F)														
Highest	24 (75)	27 (81)	30 (86)	36 (97)	36 (96)	43 (109)	44 (112)	42 (108)	42 (108)	34 (93)	29 (84)	22 (71)	44 (112)	24
Mean Daily Max	3 (38)	7 (44)	13 (56)	19 (67)	24 (76)	30 (86)	33 (92)	32 (90)	27 (81)	21 (69)	12 (53)	6 (43)	19 (67)	24
Mean	2 (29)	1 (33)	78 (44)	13 (56)	18 (65)	24 (75)	27 (81)	26 (78)	21 (69)	14 (57)	6 (43)	1 (33)	13 (56)	24
Mean Daily Min	-6 (21)	-3 (26)	2 (36)	8 (46)	13 (56)	19 (66)	22 (72)	21 (70)	16 (61)	9 (49)	2 (36)	3 (26)	8 (47)	24
Lowest	-27 (-17)	-29 (-21)	-22 (-7)	-13 (8)	-3 (27)	5 (41)	9 (48)	7 (45)	-1 (30)	-26 (14)	-22 (-8)	-31 (-23)	-31 (-23)	24
Precipitation, mm (in.)														
Mean	23 (0.9)	25 (1.0)	56 (2.2)	71 (2.8)	112 (4.4)	137 (5.4)	97 (3.8)	94 (3.7)	89 (3.5)	74 (2.9)	38 (1.5)	28 (1.1)	843 (33.2)	24
Snowfall, mm (in.)														
Mean	132 (5.2)	109 (4.3)	86 (3.4)	13 (0.5)	#	0	0	0	0	#	33 (1.3)	109 (4.3)	483 (19.0)	24
Relative Humidity, %														
Mean 0600 LST 1500 LST	77 56	77 53	77 48	77 47	82 52	83 51	81 46	83 48	82 47	79 45	78 51	78 55	80 50	24

Source of data: www.afccc.af.mil/climo Fort Riley, Kansas.
# Denotes less than 1 mm (0.05 in.).

Table A2
Construction History

Pavement Facility (Feature)	Surface Pavement Thickness, mm (in.)	Surface Pavement Type	Construction Date	Agency
Runway 4-22				
R1A, R2A, and R3A	152 (6.0) 13 (0.5)	PCC SS	1942 1989	CE[2]
Taxiway A-5				
T1Band T2C	152 (6.0)	PCC	1942	CE[2]
Taxiway A				
T3A	152 (6.0)	PCC	1942	CE[2]
Taxiway A-2				
T4A and T5A	152 (6.0)	PCC	1942	CE[2]
Taxiway A-1				
T6B	152 (6.0)	PCC	1942	CE[2]
Taxiway B				
T7B	152 (6.0)	PCC	1942	CE[2]
Taxiway B-3				
T8B	203 (8.0)	PCC	1989	CE[2]
Apron 1				
A1B A2B	152 (6.0) 152 (6.0)	PCC PCC	1940 1942	CE[2] CE[2]
Apron 2				
A3B and A4B	152 (6.0)	PCC	1942	CE[2]
Apron 3				
A5B	252 (10.0)	PCC	1957	CE[2]
Apron 4				
A6B	584 (23.0)	AC	1957	CE[2]
Helipads				
A7B	203 (8.0)	PCC	1965	CE[2]
Compass Swing Base				
A8B	152 (6.0)	PCC	1942	CE[2]
South Apron				
A9B	152 (8.0)	PCC	1989	CE[2]

[1] Thickness includes AC and base.
[2] CE = U.S. Army Corps of Engineers.

Table A3
Summary of Physical Property Data

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
R1A	Runway 4-22	305 (1,000)	46 (150)	Poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	63 (9,145)
R2A	Runway 4-22	1067 (3,500)	37 (120)	Very poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	59 (8,523)
R3A	Runway 4-22	305 (1,000)	46 (150)	Very poor				152 (6.0)	PCC	3.9 (565)							Silt (ML)	62 (9,058)
T1B	Taxiway A-5	67 (220)	15 (50)	Very poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	40 (5,862)
T2C	Taxiway A-5	129 (424)	15 (50)	Poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	53 (7,638)
T3A	Taxiway A	728 (2,390)	15 (50)	Very poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	68 (9,868)
T4A	Taxiway A-2	274 (900)	15 (50)	Poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	64 (9,216)
T5A	Taxiway A-2	244 (800)	15 (50)	Failed				152 (6.0)	PCC	3.9 (565)							Clay (CL)	63 (9,175)
T6B	Taxiway A-1	620 (2,036)	15 (50)	Very poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	54 (7,863)
T7B	Taxiway B	1100 (3,610)	15 (50)	Failed				152 (6.0)	PCC	3.9 (565)							Clay (CL)	46 (6,669)
T8B	Taxiway B-3	68 (224)	15 (50)	Excellent				203 (8.0)	PCC	4.5 (650)							Clay (CL)	110 (15,995)

(Sheet 1 of 2)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.

Table A3 (Concluded)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
A1B	Apron 1	93 (305)	30 (100)	Very poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	51 (7,450)
A2B	Apron 1	124 (406)	45 (148)	Poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	60 (8,717)
A3B	Apron 2	223 (730)	81 (265)	Poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	48 (6,968)
A4B	Apron 2	141 (464)	114 (375)	Poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	57 (8,320)
A5B	Apron 3	115 (378)	46 (150)	Excellent				254 (10.0)	PCC	4.9 (715)	102 (4.0)	Crushed Limestone	173 (25,026)				Clay (CL)	78 (11,337)
A6B	Apron 4	116 (380)	81 (267)	Failed				102 (4.0)	AC		486 (19.0)	Crushed Stone	38[3]				Clay (CL)	2[3]
A7B	Tie Down Area Helipads	6 (20) Each	4 (12.5) Each	Good				203 (8.0)	PCC	3.9 (565)							Silty Clay (CL-ML)	44 (6,342)
A8B	Compass Swing Base	122 (400)	Varies	Very poor				152 (6.0)	PCC	3.9 (565)							Clay (CL)	56 (8,072)
A9B	South Apron	750 (2,460)	199 (652)	Excellent				254 (10.0)	PCC	4.5 (650)	102 (4.0)	Crushed Stone	182 (26,411)				Clay (CL)	105 (15,240)

(Sheet 2 of 2

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[3] CBR values computed using LOW.

Table A4
Traffic Data (Class III Design Aircraft Traffic)

Aircraft	Weight kg (lb)	12-month Period Total Operations[1]	20-Year Total Operations[1]
C-23	11 168 (24,600)	2,500	50,000
CH-47	22 700 (50,000)	2,500	50,000

[1] In analysis only takeoffs are considered an operation (pass).

Appendix B
Tests and Results

Tests Conducted

The pavements were evaluated based on the results from nondestructive testing utilizing a heavy weight deflectometer (HWD). The test procedures and results are discussed below.

Nondestructive Tests

Test equipment

Nondestructive tests (NDT) were performed on the pavements with the Dynatest model 8081 (HWD). The HWD is an impact load device that applies a single-impulse transient load of approximately 25- to 30-millisecond duration. With this trailer-mounted device, a dynamic force is applied to the pavement surface by dropping a weight onto a set of rubber cushions which results in an impulse loading on an underlying circular plate 300 mm (11.8 in.) in diameter in contact with the pavement. The applied force and the pavement deflections, respectively, are measured with load cells and velocity transducers. The drop height of the weights can be varied from 0 to 399 mm (15.7 in.) to produce a force from 0 to approximately 222 kN (50,000 lb). The system is controlled with a laptop computer that also records the output data. Velocities were measured and deflections computed at the center of the load plate (D1) and at distances of 305 (12), 610 (24), 914 (36), 1219 (48), 1524 (60), and 1828 mm (72 in.) (D2 - D7) from the center of the load plate.

Test procedure

On runways and taxiways, deflection basin measurements were made at 30-m (100-ft) intervals on alternate sides of the centerline along the main gear wheel paths. The tests were performed on 3- to 4-m (10- to 12-ft) offsets alternating left and right of the centerline. The parking aprons were tested in a grid pattern of approximately 30-m (100-ft) intervals or at locations that were selected to ensure that adequate NDT were performed per feature for evaluation purposes. Lines along which the NDT were conducted are indicated in Figure B1. At each test location, pavement deflection measurements were recorded at force levels of approximately 67, 122, 157, or 222 kN (15,000, 25,000, 35,000, or 50,000 lb). Impulse stiffness modulus (ISM) values were then calculated based on the slope of the plot of impulse load versus deflection at the first sensor (D1), for the maximum force level.

NDT Analysis

The NDT results or ISM data for each facility were grouped according to different pavement features. Figures B2 through B15 graphically show the ISM test results. A representative basin for each feature was determined using the computerized Layered Elastic Evaluation Program (LEEP). Table B1 shows the representative basins for each feature as determined from the NDT.

Representative basins were used to determine section modulus values of the various layers within the pavement structure in each feature. Deflection basins were input to a multi-layered, linear elastic backcalculation program to determine the surface, base, and subgrade modulus values. The program determines a set of modulus values that provide the best fit between a measured (NDT) deflection basin and a computed (theoretical) deflection basin. Table B2 presents a summary of the backcalculated modulus values based on the representative basins for each pavement section.

Where mean ISM values (as shown in Table B1) were less than 70 MN/m (400 kips/in), the Low Volume Airfield Pavement Procedure (Bush 1986) computer program (LOW) was used to evaluate the pavements. Feature A6B was in this category. ISM and layer thicknesses were input into LOW to determine the equivalent base and subgrade California Bearing Ratio (CBR). Layer thicknesses and respective CBR values were then input into the computer program APE (Computer-Aided Airfield Pavement Evaluation) to compute the load-carrying capacity (PCN) of the pavements and the overlay thickness requirements.

Modulus values for PCC pavements can be backcalculated using the FWD deflection basins or a design modulus for the PCC can be used. In the evaluation of a rigid pavement, the design modulus should be used for the PCC layer along with the backcalculated values for the subgrade layers. The backcalculated PCC modulus values shown in Table B2 are within the default range of 17 237 to 48 263 MPa (2,500,000 to 7,000,000 psi) recommended in UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force, and the Navy 2001). This manual also recommends a modulus of 34 474 MPa (5,000,000 psi) for a PCC layer in good condition.

The ability of the joints in the PCC slabs to transfer load is measured with the HWD device. The ratio of deflections measured on each side of the joint (deflection of unloaded side/deflection of loaded side) is related to joint efficiency or load transfer. Joint tests were conducted at select locations on the PCC pavements. Table B3 shows the summaries of joint ratio test on select PCC pavements.

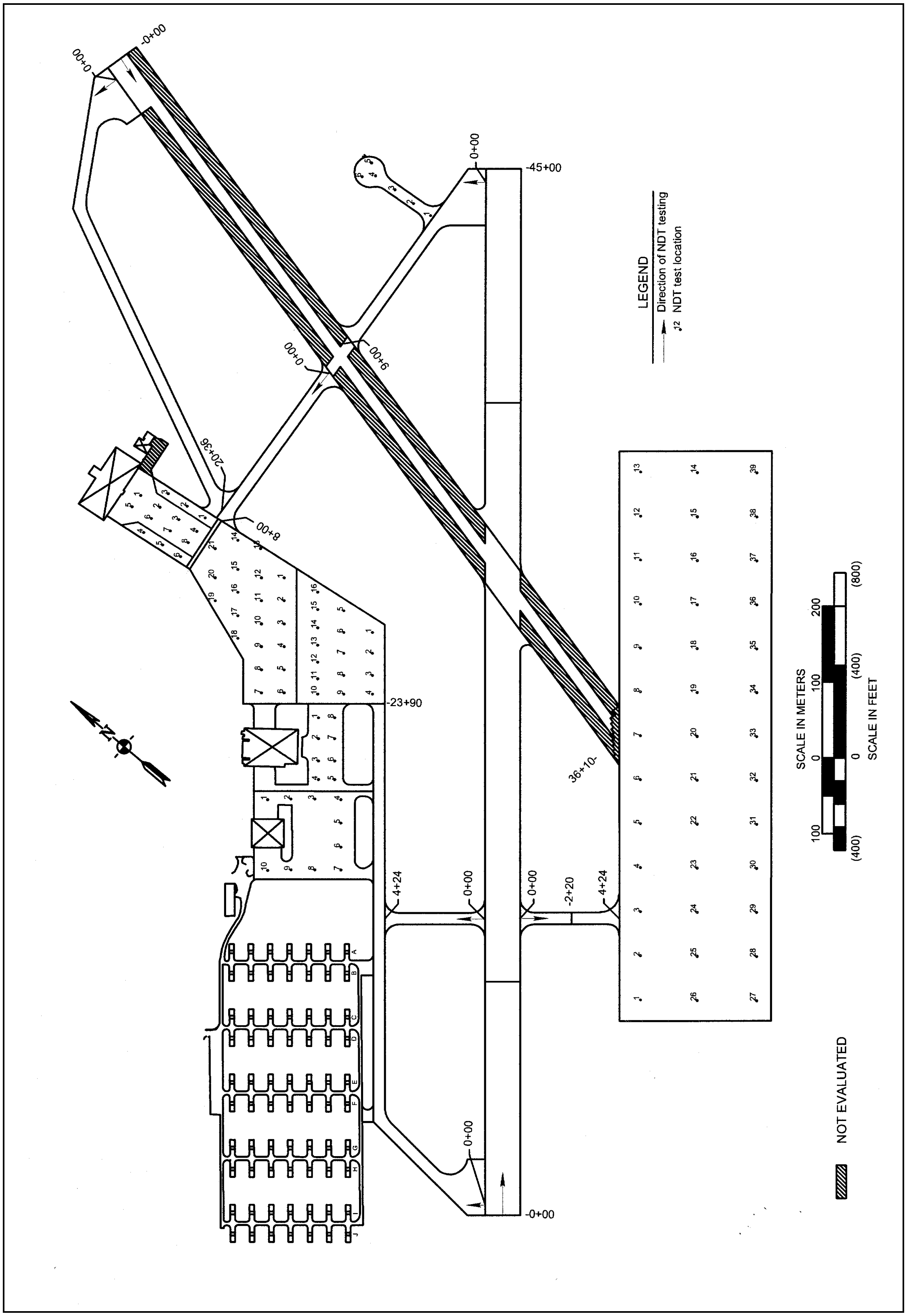

Figure B1. NDT test locations/direction

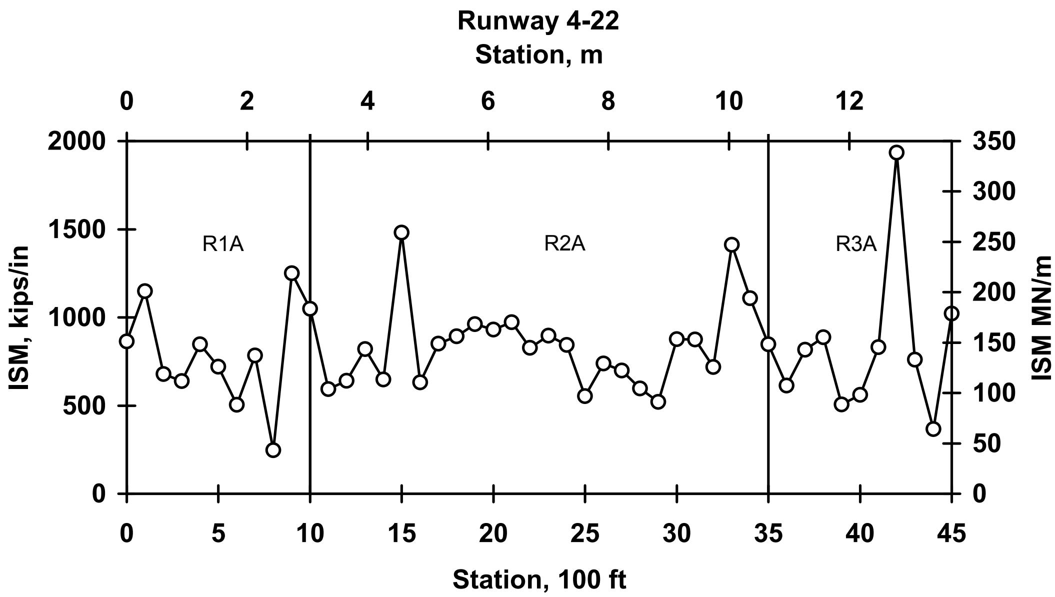

Figure B2. ISM profile, Runway 4-22, Features R1A thru R3A

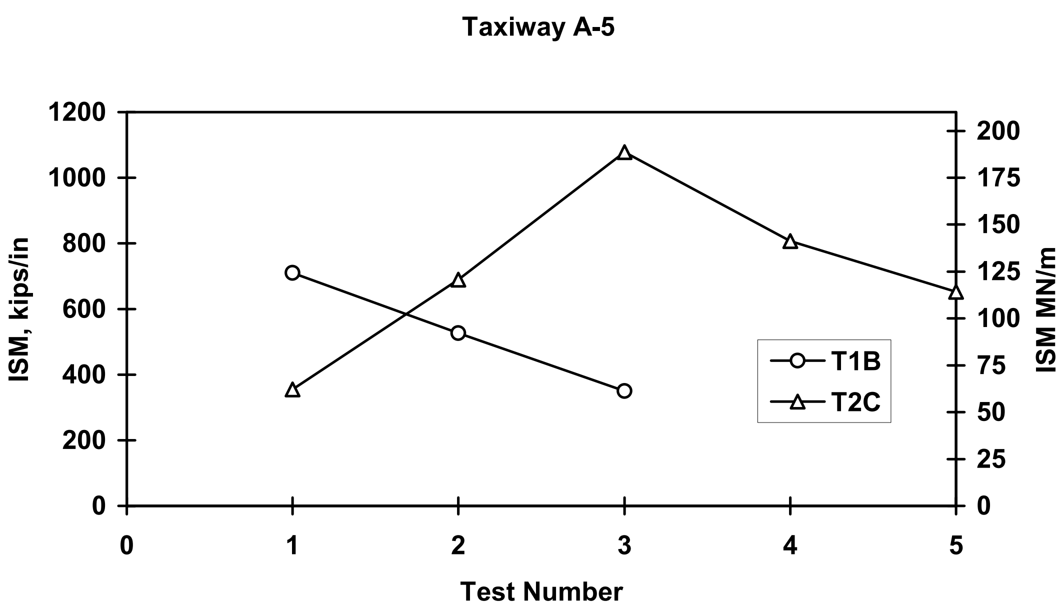

Figure B3. ISM profile, Taxiway A-5, Features T1B and T2C

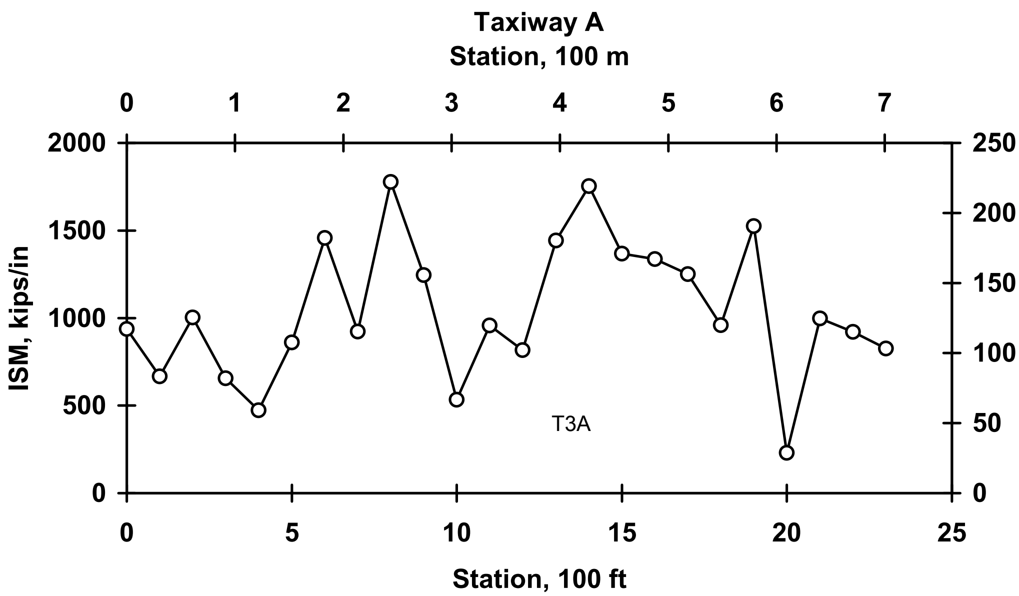

Figure B4. ISM profile, Taxiway A, Feature T3A

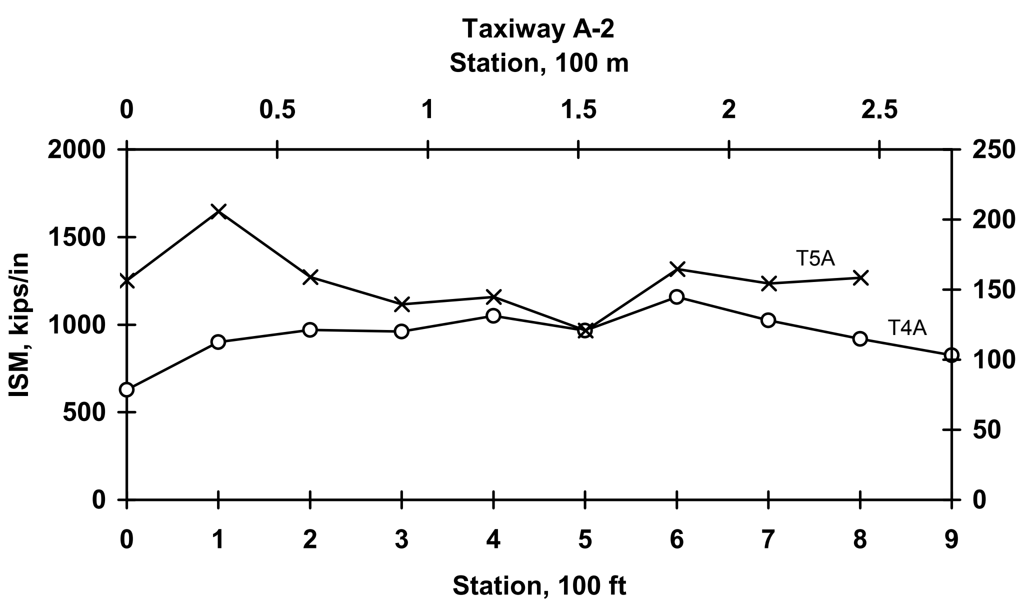

Figure B5. ISM profile, Taxiway A-2, Features T4A and T5A

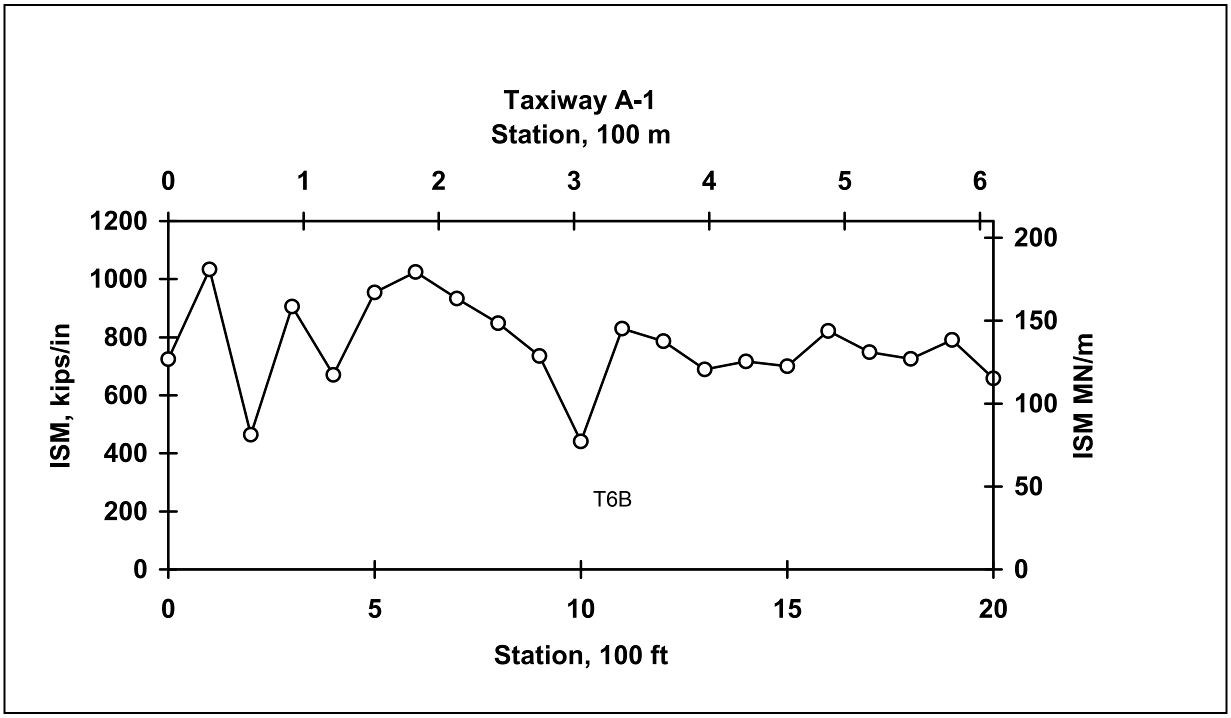

Figure B6. ISM profile, Taxiway A-1, Feature T6B

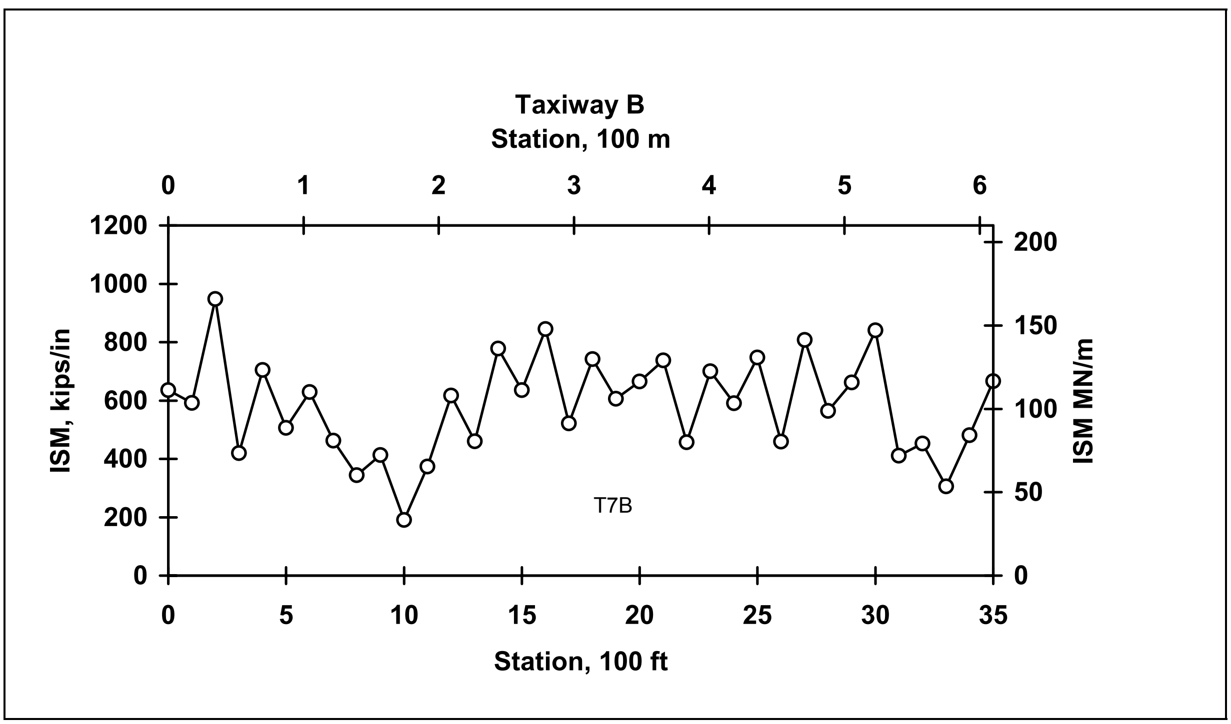

Figure B7. ISM profile, Taxiway B, FeatureT7B

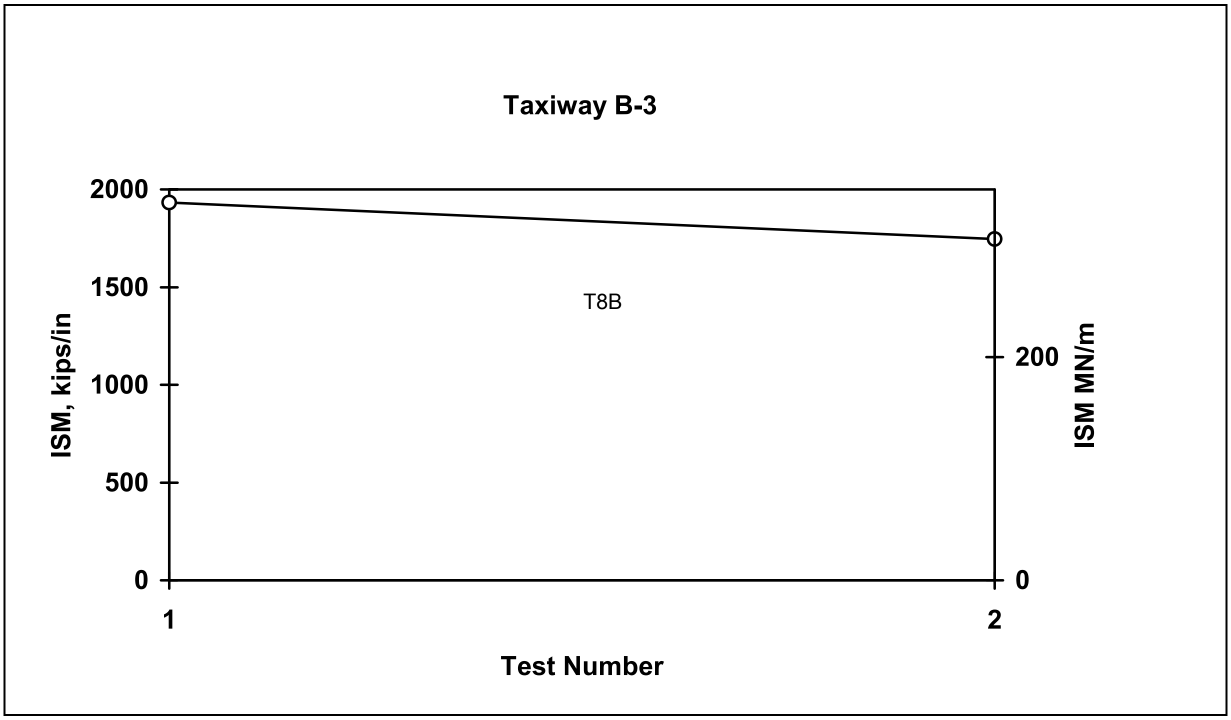

Figure B8. ISM profile, Taxiway B-3, Feature T8B

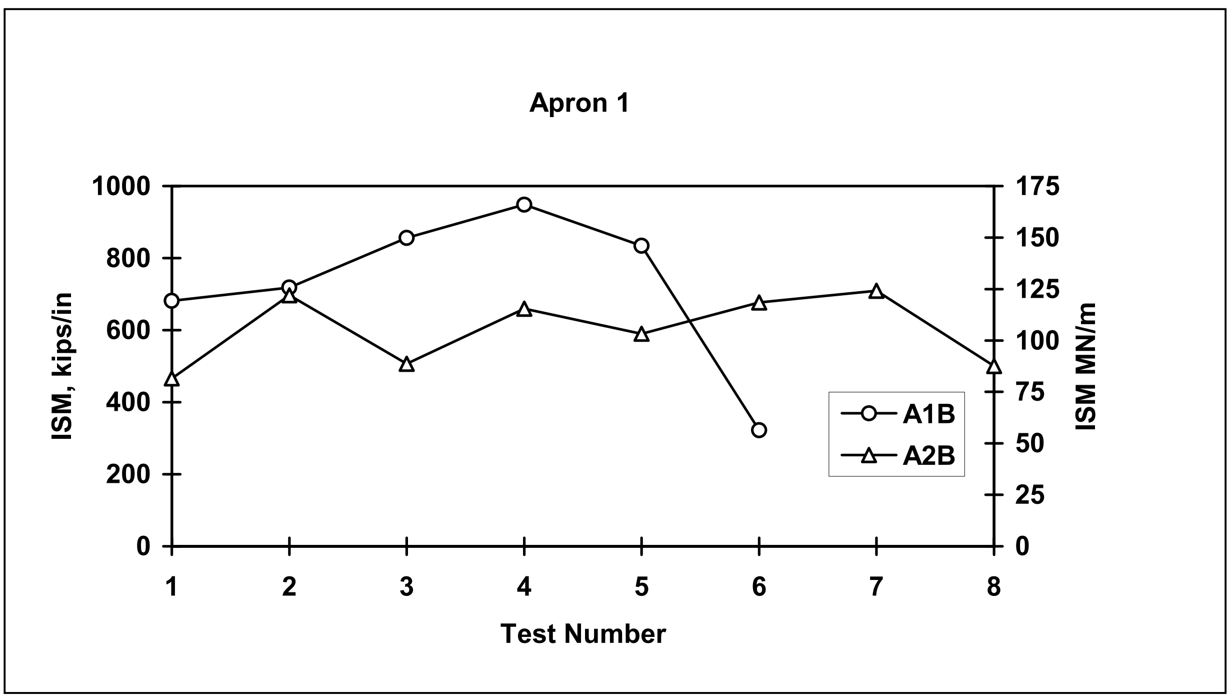

Figure B9. ISM profile, Apron 1, Features A1B and A2B

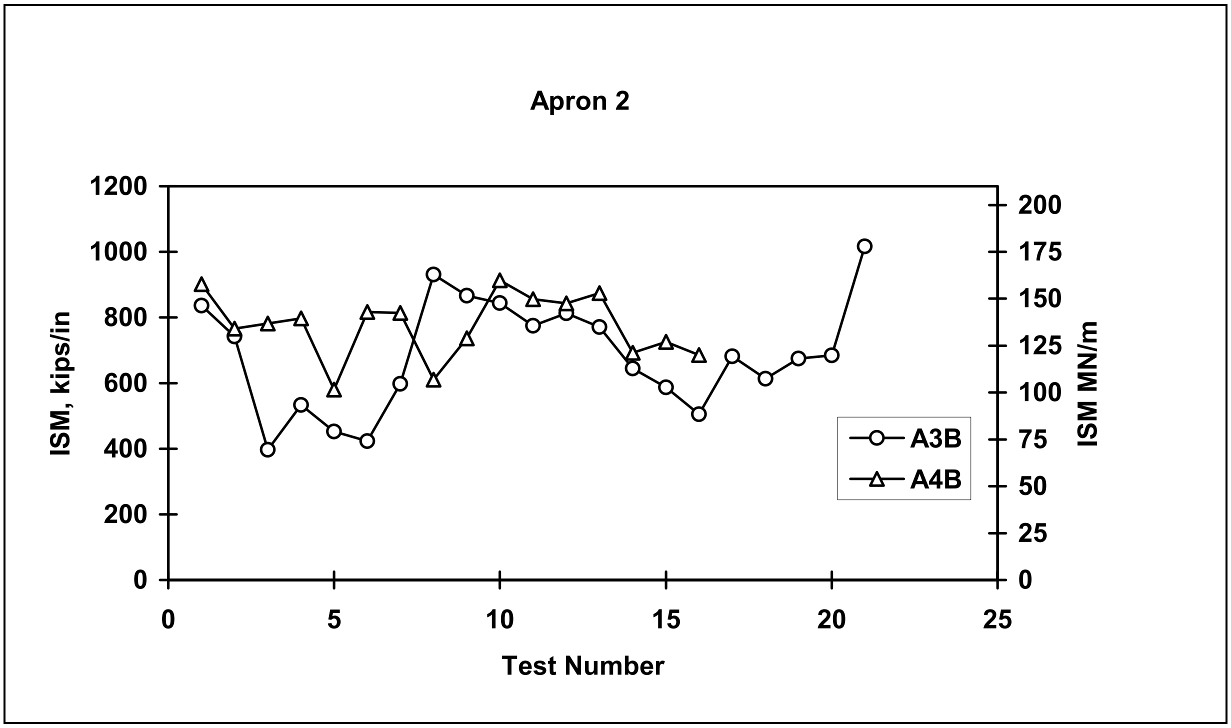

Figure B10. ISM profile, Apron 2, Features A3B and A4B

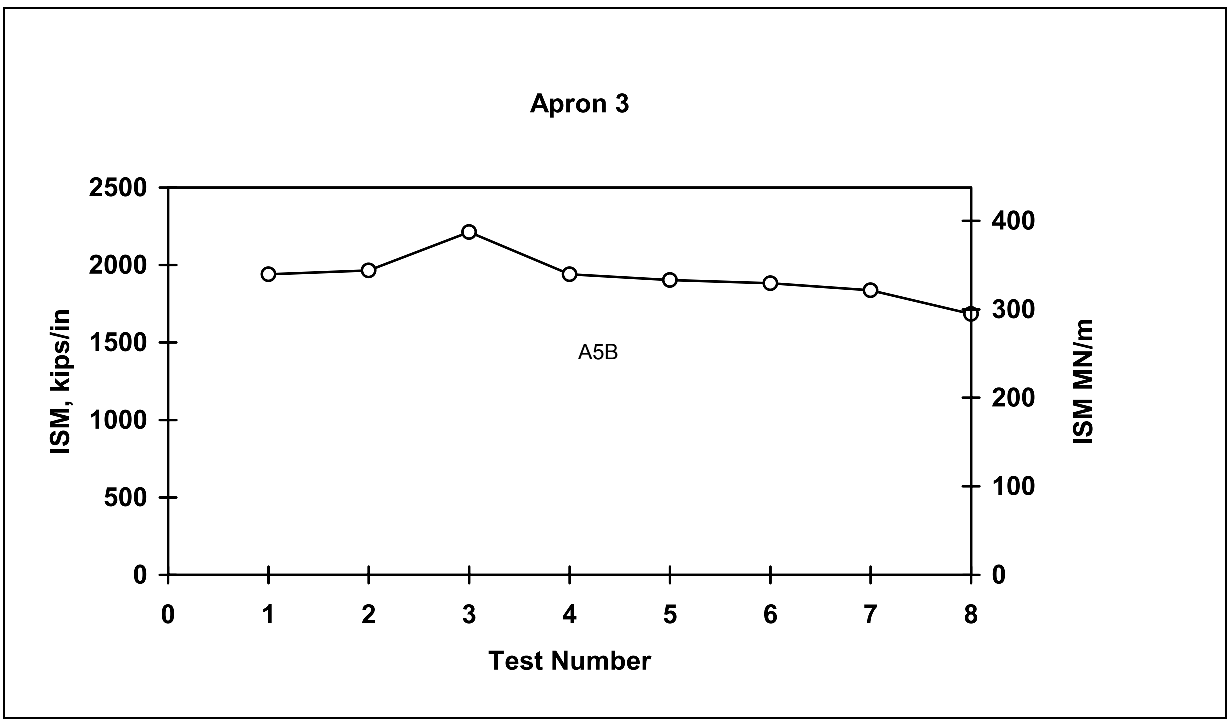

Figure B11. ISM profile, Apron 3, Feature A5B

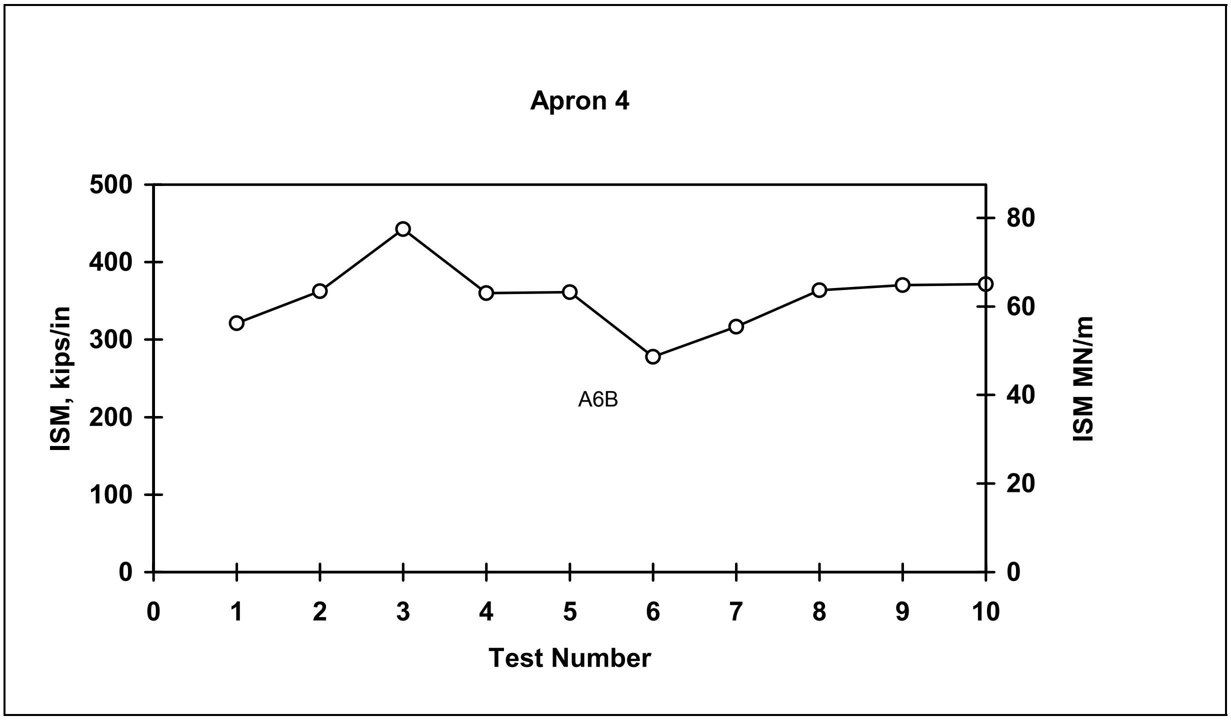

Figure B12. ISM profile, Apron 4, Feature A6B

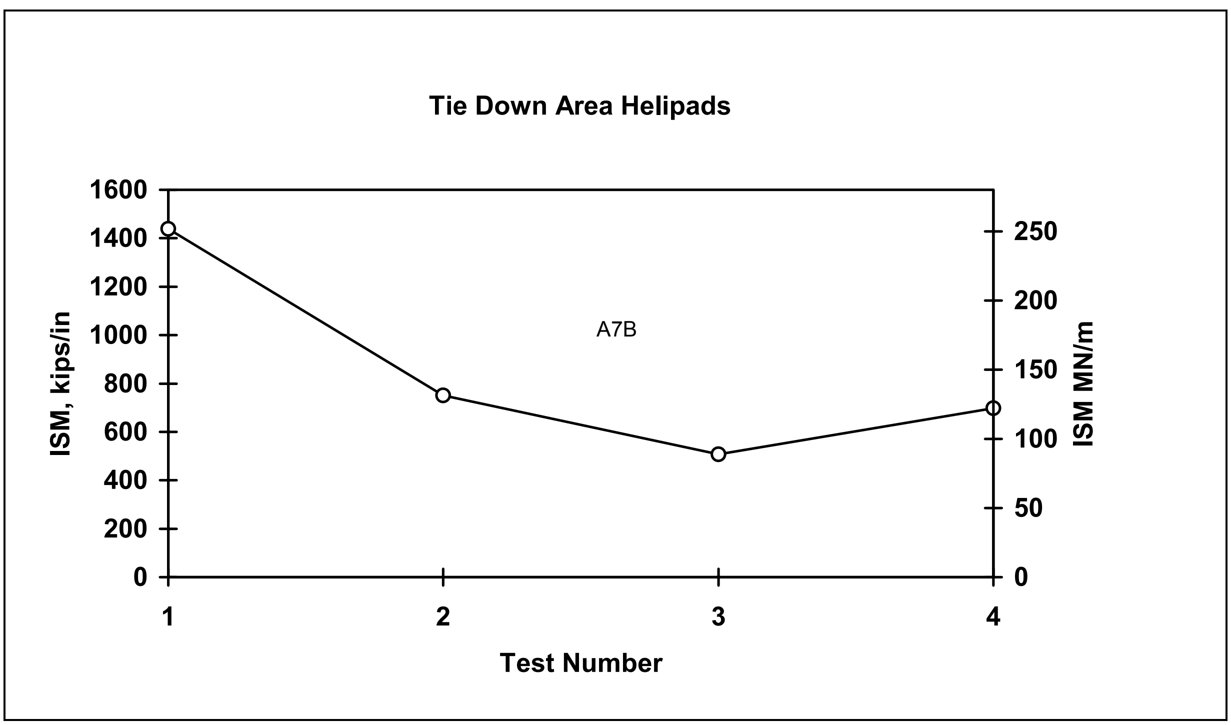

Figure B13. ISM profile, Tie Down Area Helipads, Features A7B

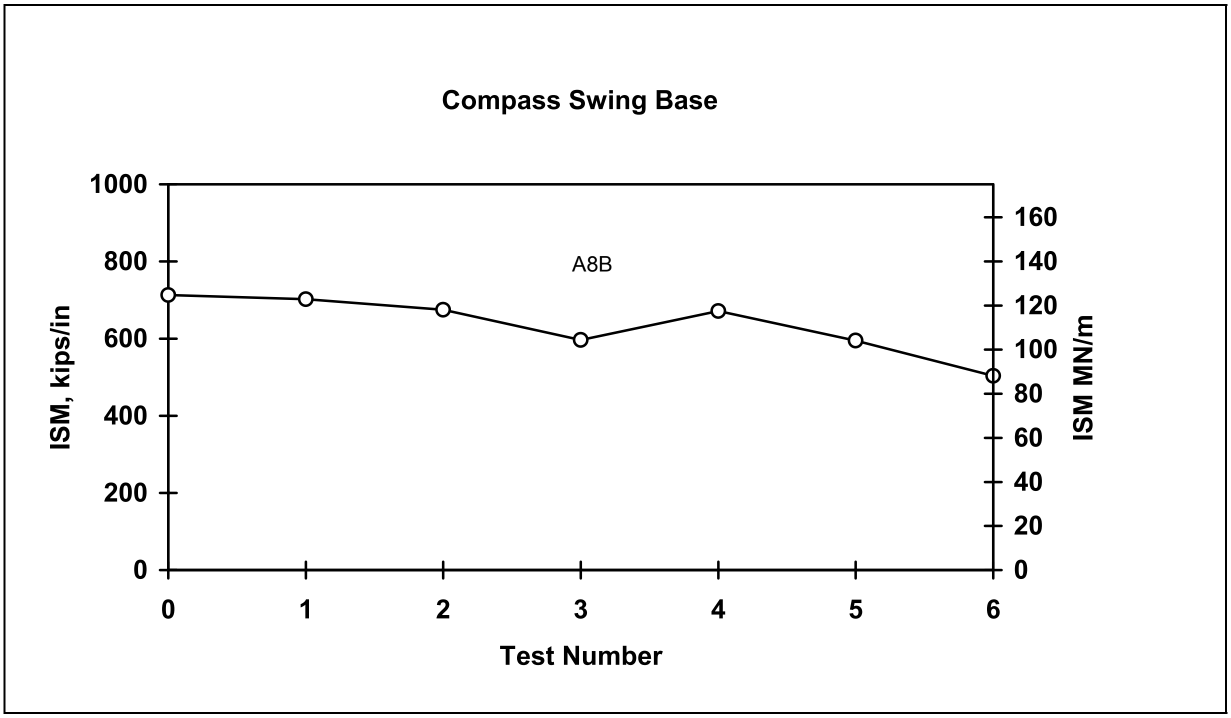

Figure B14. ISM profile, Compass Swing Base, Feature A8B

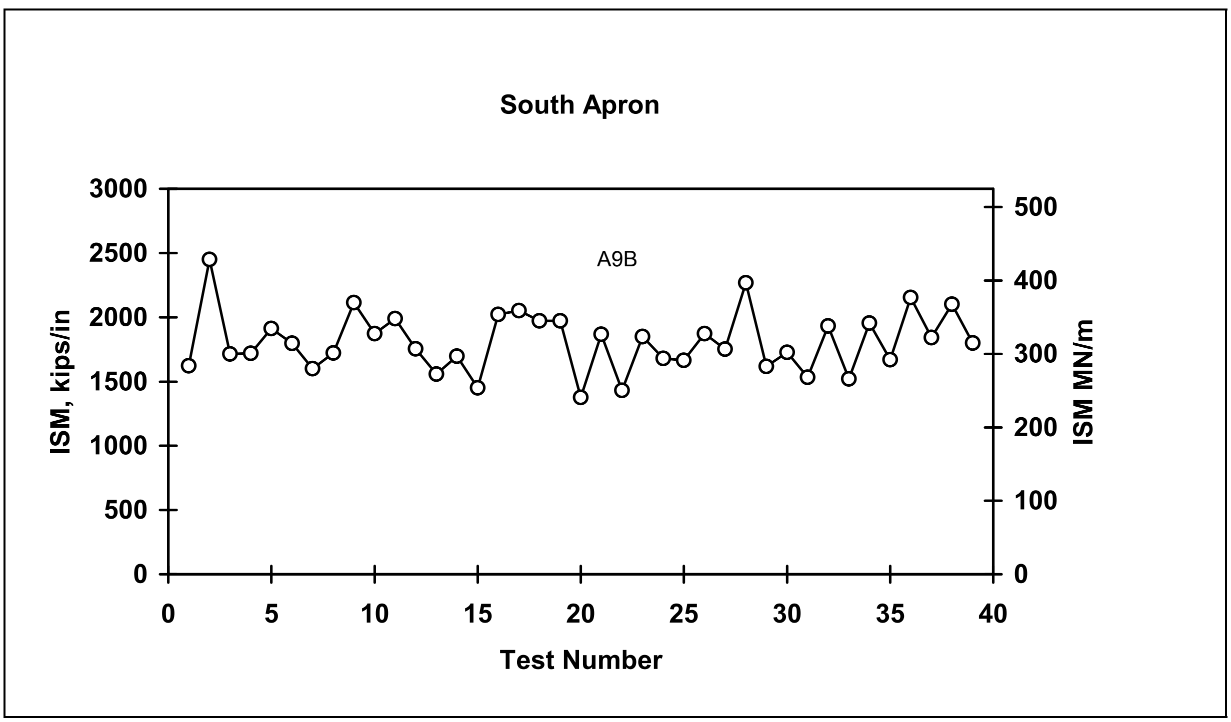

Figure B15. ISM profile, South Apron, Feature A9B

Table B1
NDT Test Results, Representative Basins

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, µm (mils) D1	D2	D3	D4	D5	D6	D7
Runway 4-22									
R1A	153 (875)	135 (30,156)	904 (35.6)	818 (32.2)	676 (26.6)	536 (21.1)	406 (16.0)	300 (11.8)	216 (8.5)
R2A	145 (828)	123 (27,490)	843 (33.2)	767 (30.2)	640 (25.2)	508 (20.0)	391 (15.4)	295 (11.6)	218 (8.6)
R3A	143 (817)	126 (28,181)	876 (34.5)	767 (30.2)	630 (24.8)	498 (19.6)	378 (14.9)	287 (11.3)	211 (8.3)
Taxiway A-5									
T1B	92 (527)	91 (20,383)	983 (38.7)	907 (35.7)	747 (29.4)	579 (22.8)	430 (16.9)	310 (12.2)	221 (8.7)
T2C	121 (690)	97 (21,539)	792 (31.2)	711 (28.0)	574 (22.6)	447 (17.6)	338 (13.3)	259 (10.2)	196 (7.7)
Taxiway A-5									
T3A	168 (958)	121 (27,009)	716 (28.2)	650 (25.6)	543 (21.4)	434 (17.1)	335 (13.2)	249 (9.8)	185 (7.3)
Taxiway A-2									
T4A	158 (901)	121 (26,946)	759 (29.9)	683 (26.9)	559 (22.0)	447 (17.6)	351 (13.8)	274 (10.8)	206 (8.1)
T5A	179 (880)	121 (26,942)	777 (30.6)	693 (27.3)	569 (22.4)	452 (17.8)	351 (13.8)	272 (10.7)	208 (8.2)
Taxiway A-1									
T6B	138 (790)	119 (26,473)	851 (33.5)	770 (30.3)	640 (25.2)	517 (20.3)	404 (15.9)	310 (12.2)	234 (9.2)
Taxiway B									
T7B	110 (629)	117 (26,044)	1051 (41.4)	955 (37.6)	798 (31.4)	630 (24.8)	478 (18.8)	351 (13.8)	259 (10.2)
Taxiway B-3									
T8B	338 (1,930)	102 (22,771)	300 (11.8)	274 (10.8)	231 (9.1)	193 (7.6)	155 (6.1)	130 (5.1)	107 (4.2)
Apron 1									
A1B	126 (718)	117 (25,996)	919 (36.2)	798 (31.4)	660 (26.0)	528 (20.8)	417 (16.4)	325 (12.8)	249 (9.8)
A2B	122 (697)	114 (25,448)	927 (36.5)	876 (34.5)	681 (26.8)	495 (19.5)	351 (13.8)	257 (10.1)	185 (7.3)
Apron 2									
A3B	130 (742)	117 (26,052)	892 (35.1)	836 (32.9)	737 (29.0)	579 (22.8)	447 (17.6)	338 (13.3)	249 (9.8)
A4B	134 (767)	114 (25,452)	843 (33.2)	762 (30.0)	620 (24.4)	490 (19.3)	373 (14.7)	282 (11.1)	203 (8.0)
Apron 3									
A5B	340 (1,940)	123 (27,550)	36154 (14.2)	345 (13.6)	312 (12.3)	274 (10.8)	234 (9.2)	193 (7.6)	155 (6.1)
Apron 4									
A6B	63 (360)	60 (13,328)	940 (37.0)	445 (17.5)	183 (7.2)	117 (4.6)	86 (3.4)	743 (2.9)	61 (2.4)

(Continued)

Table B1 (Concluded)

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, µm (mils)						
			D1	D2	D3	D4	D5	D6	D7
Tie Down Area Helipads									
A7B	122 (698)	120 (26,862)	978 (38.5)	876 (34.5)	732 (28.8)	610 (24.0)	495 (19.5)	368 (14.5)	300 (11.8)
Compass Swing Base									
A8B	117 (671)	114 (25,480)	965 (38.0)	866 (34.1)	711 (28.0)	556 (21.9)	411 (16.2)	284 (11.2)	175 (6.9)
South Apron									
A9B	354 (2,020)	166 (36,972)	465 (18.3)	432 (17.0)	376 (14.8)	315 (12.4)	262 (10.3)	211 (8.3)	170 (6.7)

Table B2
Summary of Modulus Values[1]

Feature	Surface Modulus MPa (psi[1])	Base Modulus MPa (psi[1])	Subgrade Modulus MPa (psi[1])
PCC Pavements			
R1A	33 395 (4,843,554)	--	63 (9,145)
R2A	35 524 (5,152,374)	--	59 (8,523)
R3A	32 649 (4,735,363)	--	62 (9,058)
T1B	19 380 (2,810,831)	--	40 (5,862)
T2C	27 260 (3,953,735)	--	53 (7,638)
T3A	40 950 (5,939,309)	--	68 (9,868)
T4A	41 654 (6,041,422)	--	64 (9,216)
T5A	38 921 (5,644,965)	--	63 (9,175)
T6B	36 855 (5,345,472)	--	54 (7,863)
T7B	25 656 (3,721,046)	--	46 (6,669)
T8B	54 216 (7,863,334)	--	110 (15,995)
A1B	33 564 (4,868,067)	--	51 (7,450)
A2B	20 015 (2,903,013)	--	60 (8,717)
A3B	34 898 (5,061,548)	--	48 (6,968)
A4B	30 784 (4,464,880)	--	57 (8,320)
A5B	41 174 (5,971,893)	172 (25,026)	78 (11,337)
A7B	17 418 (2,526,331)	--	43 (6,274)
A8B	21 462 (3,112,932)	--	56 (8,072)
A9B	60 240 (8,737,128)	182 (26,411)	105 (15,240)
AC Pavements			
A6B	--	38[2]	2[2]

[1] Backcalculated modulus values using WESDEF.
[2] Average ISM value less than 400. LOW volume evaluation program used to determine CBR.
[5] Subbase and subgrade were combined.

Table B3
Joint Deflection Ratio

Feature	Construction Date	Joint Ratio, D2/D1 (%)
R1A	1942	100
R2A	1942	94
R3A	1942	95
	Average	96
T6B	1942	94
T6B	1942	90
T6B	1942	88
	Average	91
T7B	1942	82
T7B	1942	95
T7B	1942	90
	Average	89
A2B	1942	52
A2B	1942	71
A2B	1942	69
	Average	64
A4B	1942	85
A4B	1942	68
A4B	1942	94
A4B	1942	87
	Average	84
A5B	1957	97
A5B	1957	98
A5B	1957	97
A5B	1957	99
	Average	97
A9B	1987	90
A9B	1987	98
A9B	1987	83
A9B	1987	94
A9B	1987	92
A9B	1987	95
	Average	92

Appendix C
Pavement Condition Survey and Results

Pavement Condition Survey

A pavement condition survey is a visual inspection of the airfield pavements to determine the present surface condition. The condition survey consists of inspecting the pavement surface for various types of distress, determining the severity of each distress, and measuring the quantity of each distress. The estimated quantities and severity of each distress type are used to compute the PCI for each feature. The PCI is a numerical indicator based on a scale from 0 to 100 and is determined by measuring pavement surface distress that reflects the surface condition of the pavement. Pavement condition ratings (from excellent to failed) are assigned to different levels of PCI values. These ratings and their respective PCI value definitions are shown in Figure C1. The distress types, severity levels, methods of survey, and PCI calculations are described in ASTM D5340-93.

The PCI and estimated distress quantities are determined for each feature. The information is based on inspection of a selected number of sample units. Sample units are subdivisions of a feature used exclusively to facilitate the inspection process and reduce the effort needed to determine distress quantities and the PCI. Each feature was divided into sample units. The sample units for AC pavement features were approximately 465 sq m (5,000 sq ft). A statistical sampling technique was used to determine the number of sample units to be inspected to provide a 95 percent confidence level. Sample units were chosen along the centerline of the taxiways and randomly on the runway and on the aprons. Sample unit locations for the various runway features are shown in Figure C2. Sample unit locations for the taxiway and apron features are shown in Figures C3 through C8. The surveyed sample units are circled. After the sample units were inspected, the mean PCI of all sample units within a feature was calculated and the feature was rated as to its condition: excellent, very good, good, fair, poor, very poor, or failed.

Analysis of PCI Data

The distress information collected during the survey was used with the Micro PAVER computer program to estimate the quantities of distress types for each feature. This information is presented along with the PCI, general rating, and distress mechanism (load, climate, or other) in Appendix E. Photos C1 through C10 show various types of distresses observed during the survey.

AR 420-72 (Headquarters, Department of the Army 2000) requires that all airfield pavements be maintained at or above the following PCI ranges:

All runways > 70
All primary taxiways ≥ 60
All aprons and secondary taxiways > 55

AR 420-72 (Headquarters, Department of the Army 2000) also requires that the following PCI range for airfield pavements shall be used for the Installation Status Report (ISR) rating:

70 < PCI ≤ 100 equals an ISR Green rating
55 < PCI ≤ 70 equals an ISR Amber rating
0 < PCI ≤ 55 equals an ISR Red rating

The PCI for each sample unit inspected was calculated and stored on a Micro PAVER file for MAAF. The mean PCI for each feature was then calculated to determine the general condition or rating of the feature as shown in Figure C9. A comparison of the 1983, 1987, 1994, and 2002 PCI results is summarized in Table C1. The PCI of six of the airfield features decreased from three to thirty-five points during the 1994 to 2002 period. This loss in PCI points is considered normal (4 to 6 points per year). Feature T1B decreased from 66 to 13. This was due to new construction (T8B) included in the previous survey. The PCI of eleven of the airfield features remained the same or increased from one to twenty-one points during the 1994 to 2002 period. This was because cracks were sealed on features A1B, and A2B.

PAVEMENT CONDITION INDEX (PCI)	PAVEMENT CONDITION RATING
100 – 86	EXCELLENT
85 – 71	VERY GOOD
70 – 56	GOOD
55 – 41	FAIR
40 – 26	POOR
25 – 11	VERY POOR
10 – 0	FAILED

Figure C1. Scale for pavement condition rating

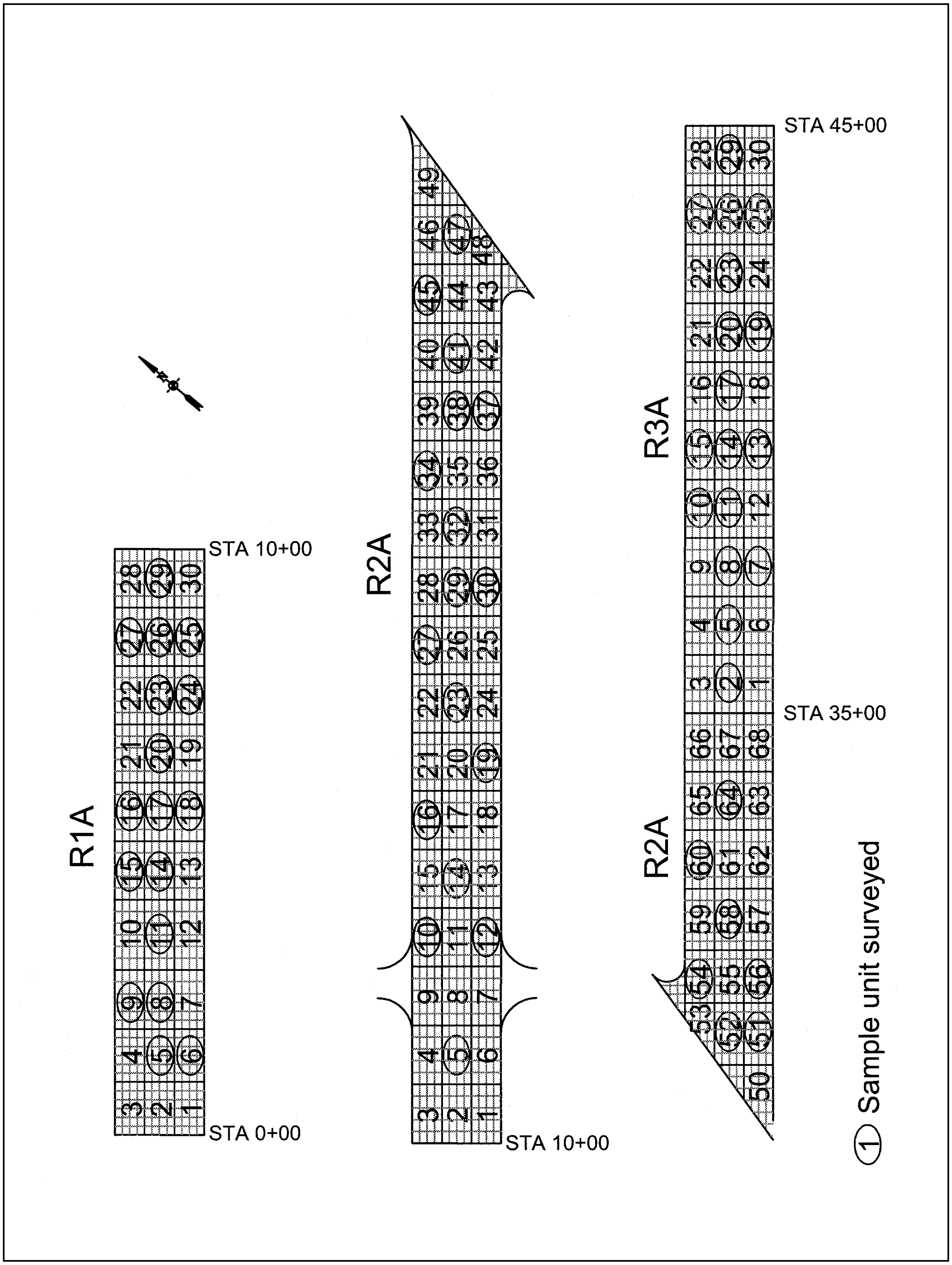

Figure C2. Sample unit layout, Runway 4-22, Features R1A through R3A

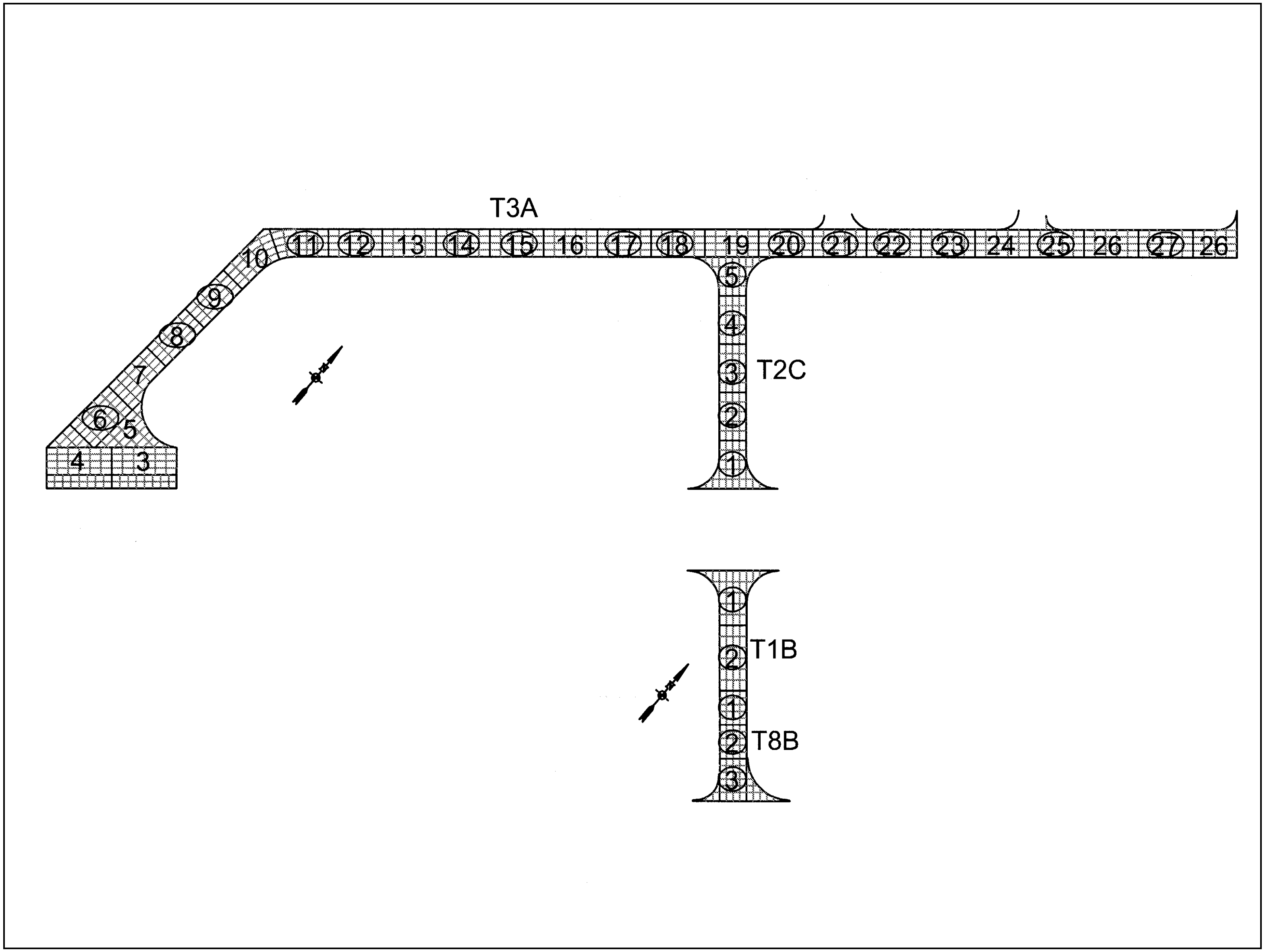

Figure C3. Sample unit layout, Taxiway A-5, Taxiway A and Taxiway B-3, Features T1B, T2C, T3A, and T8B

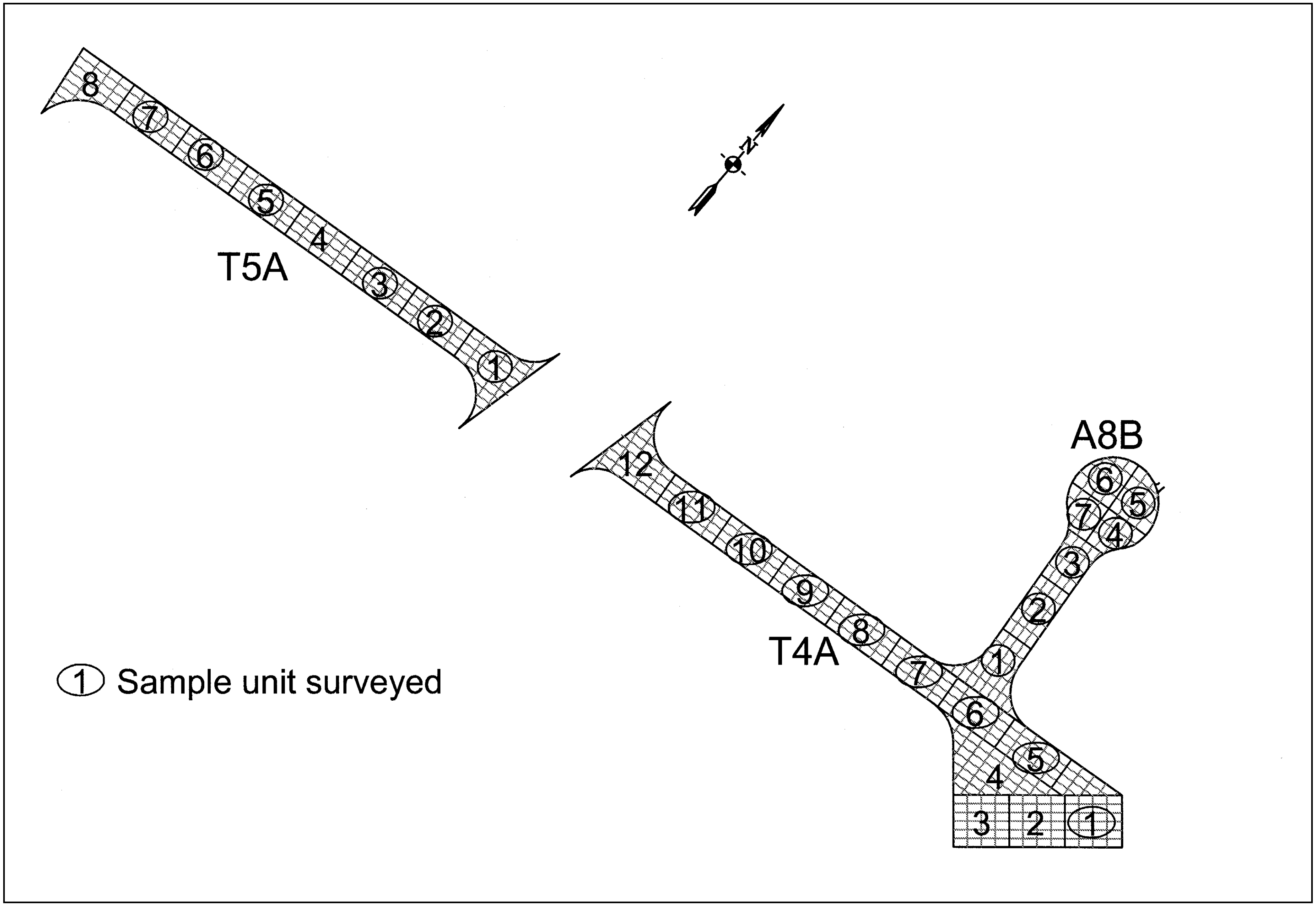

Figure C4. Sample unit layout, Taxiway A-2 and the Compass Swing Base (T4A, T5A, and A8B)

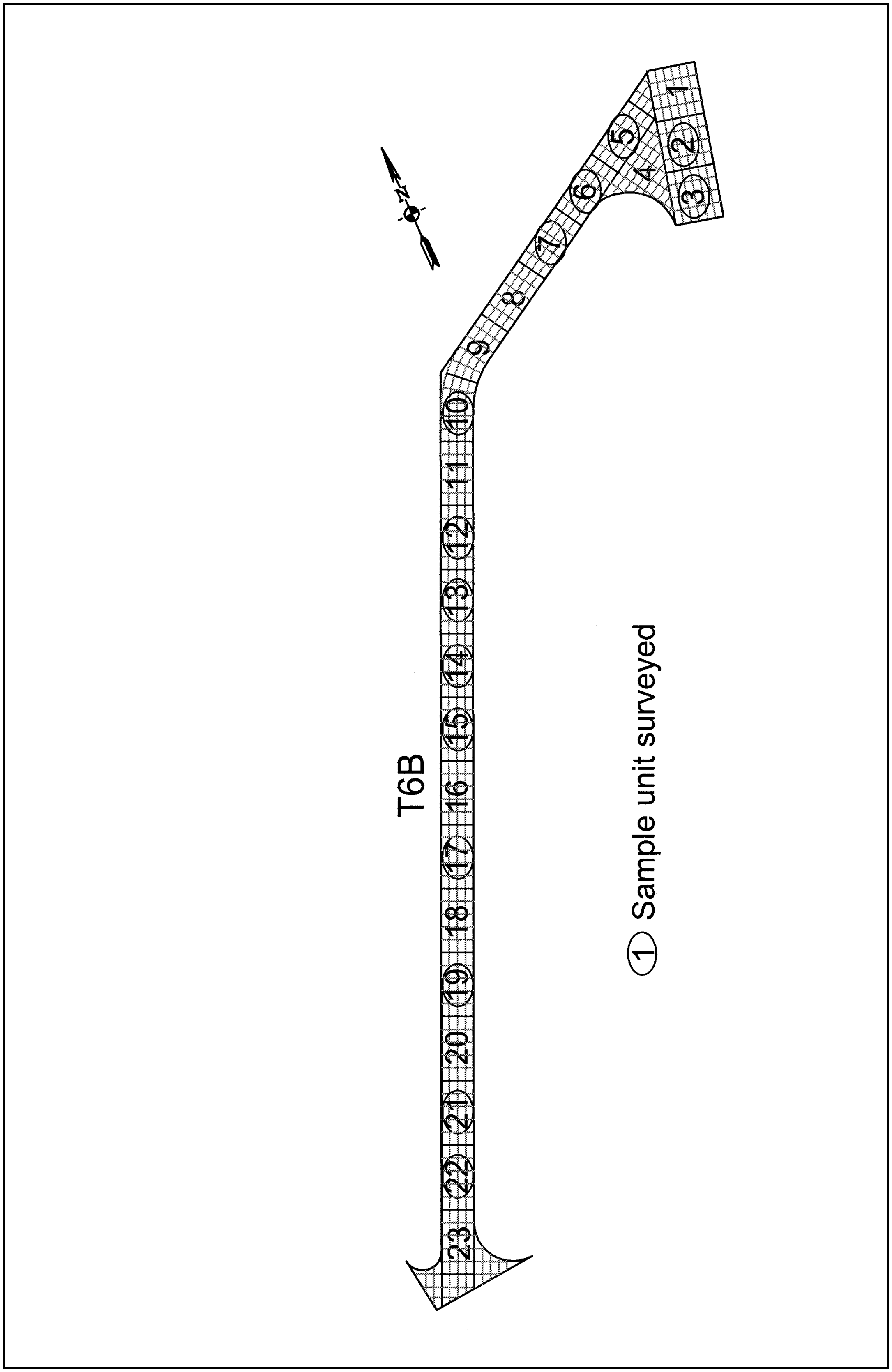

Figure C5. Sample unit layout, Taxiway A-1 (T6B)

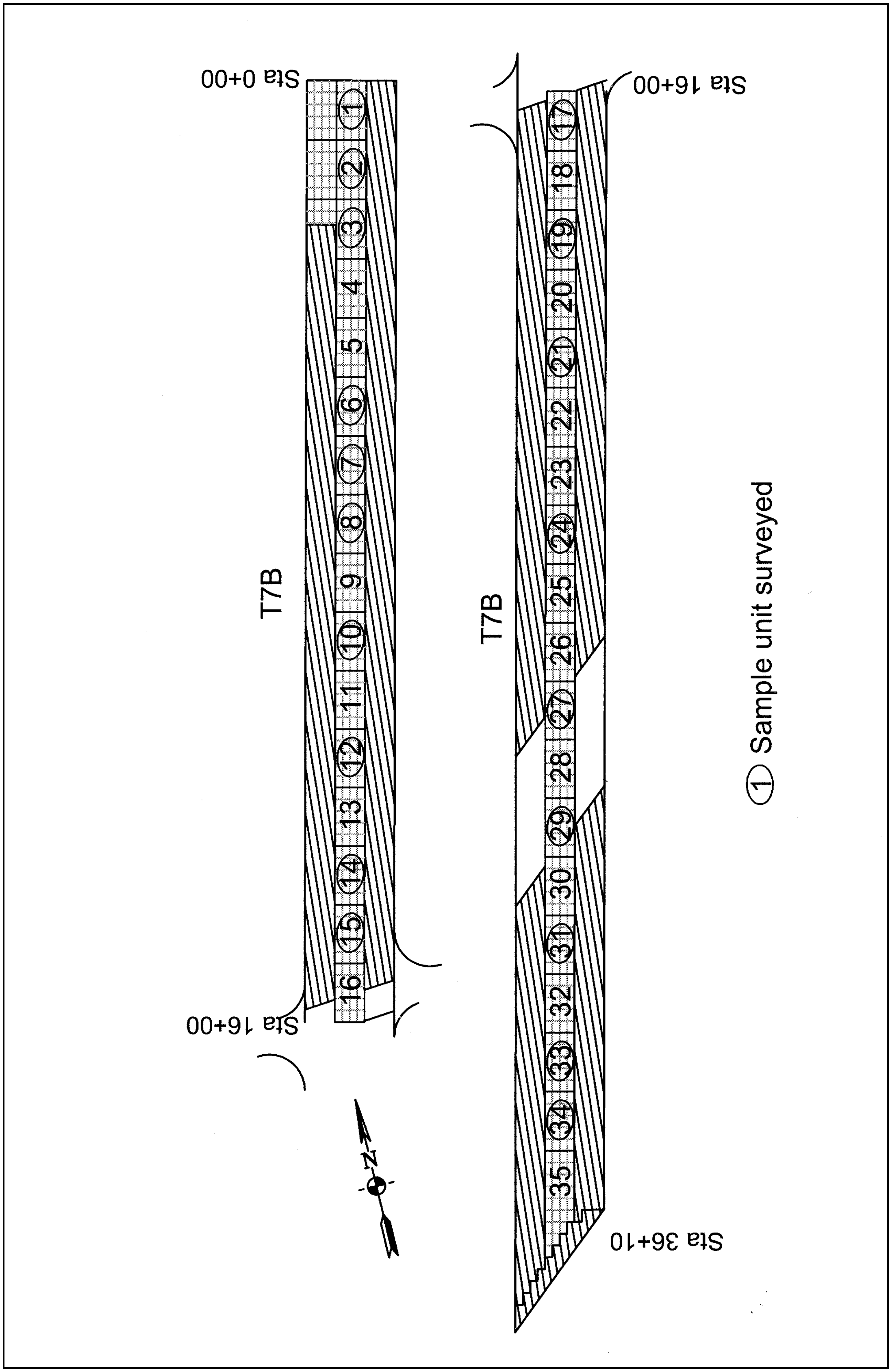

Figure C6. Sample unit layout, Taxiway B (T7B)

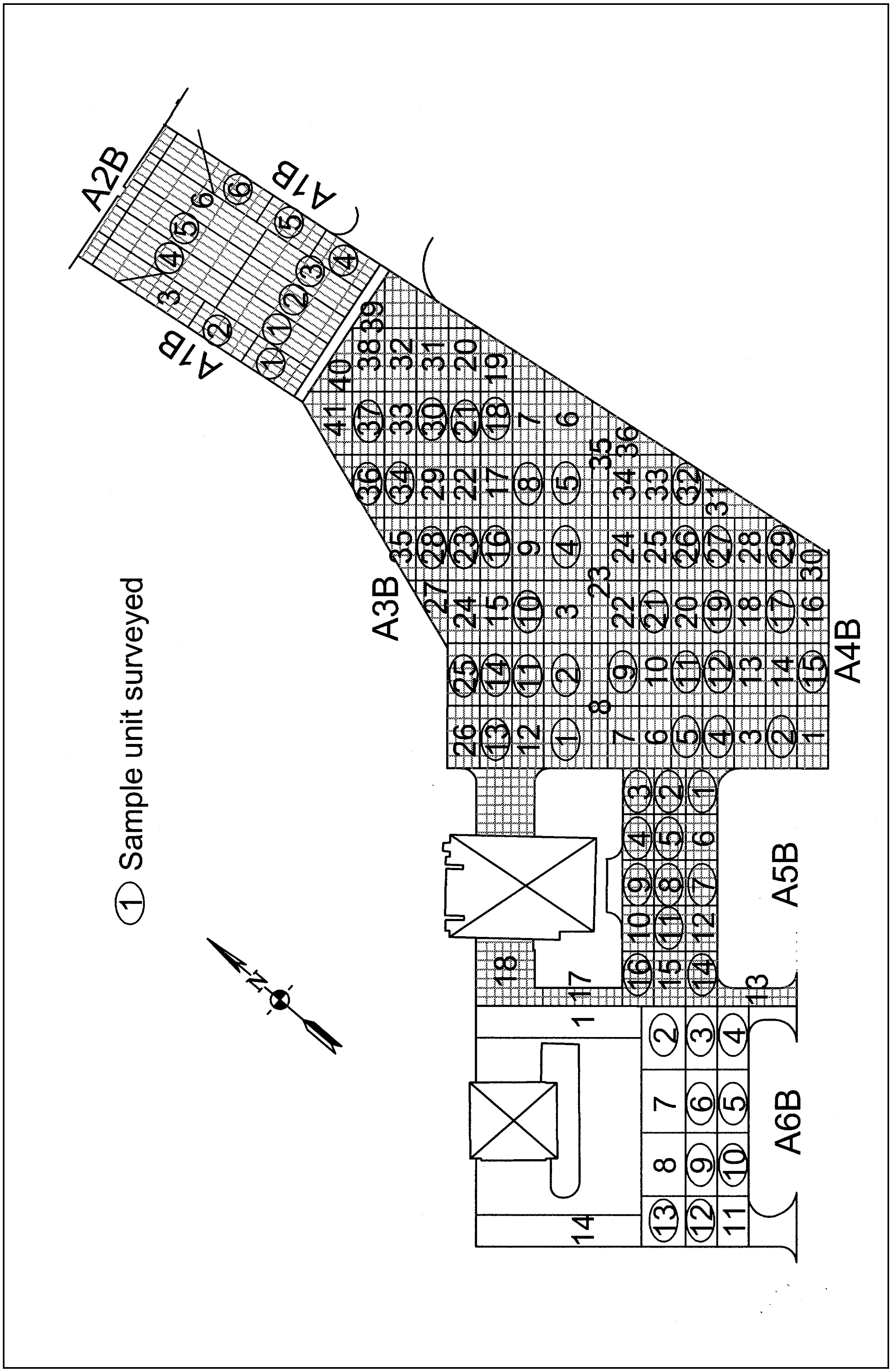

Figure C7. Sample unit layout, Aprons 1, 2, 3,and 4 Features A1B, A2B, A3B, A4B, A5B, and A6B

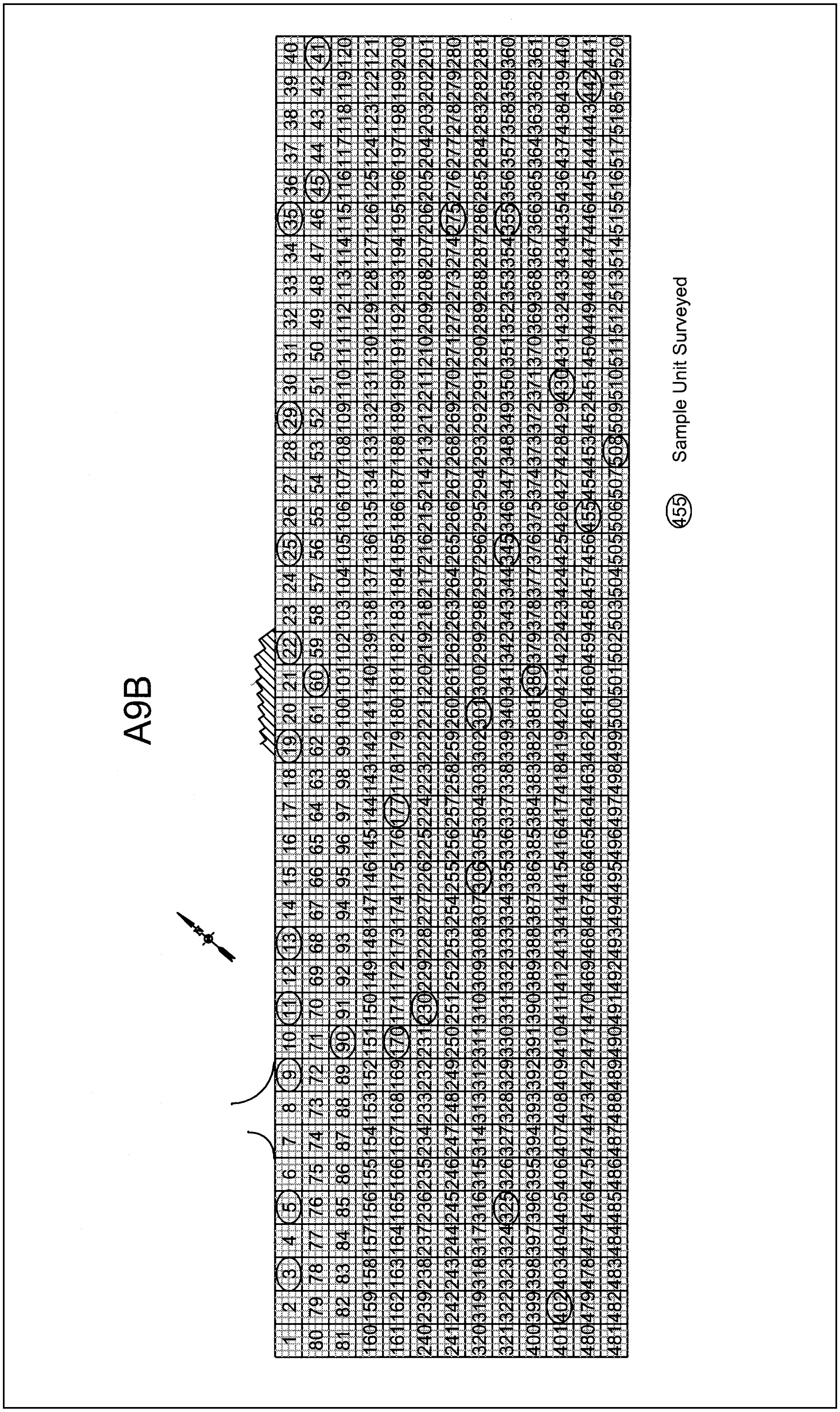

Figure C8. Sample unit layout, South Apron Feature A9B

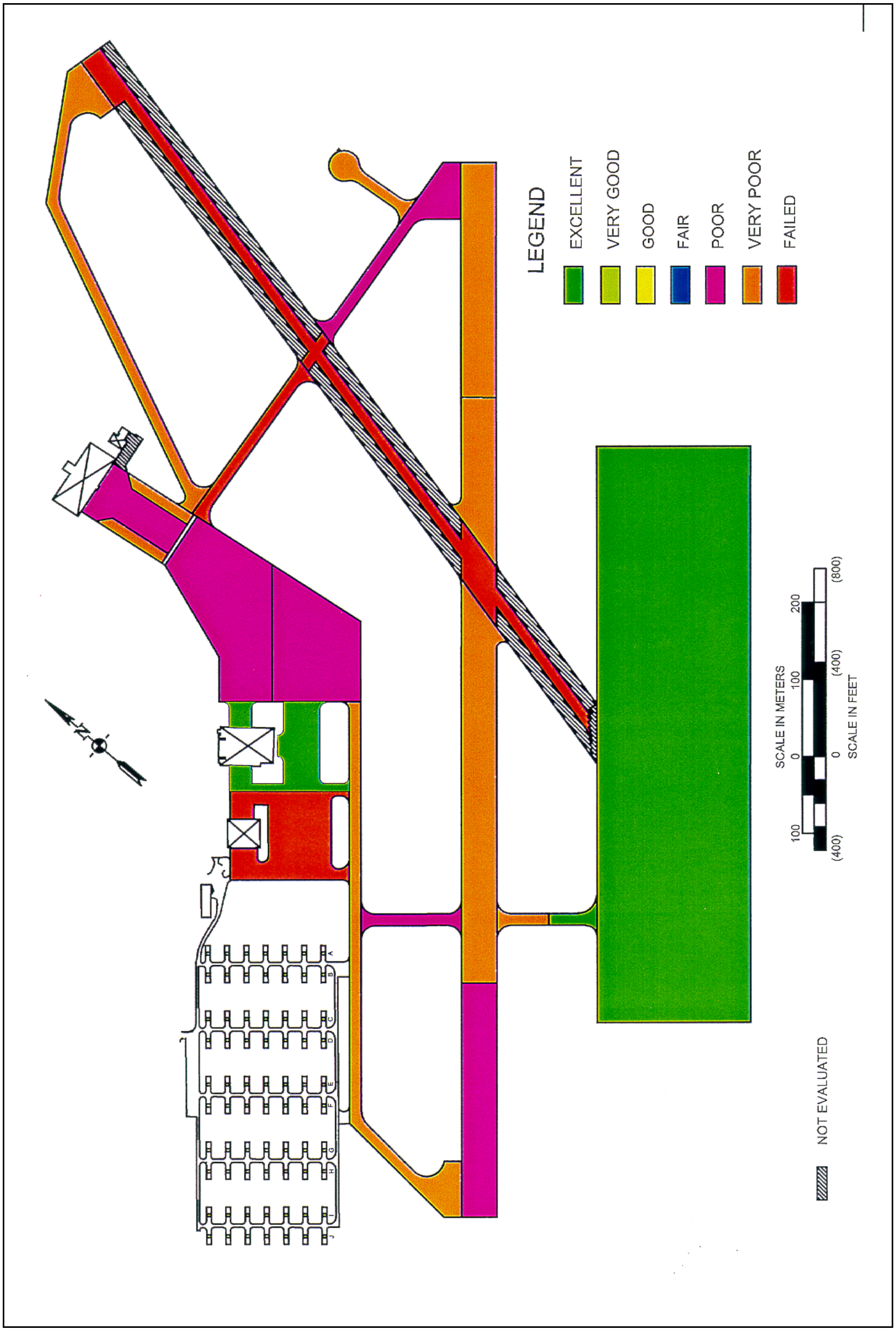

Figure C9. Pavement condition rating summary

Table C1
Comparison of 1983, 1987, 1994 and 2002 PCI Surveys

Feature	1983 PCI	1987 PCI	1994 PCI	2002 PCI	2002 Rating	Change in PCI From 1997 to 2002 (+ or -)	Pavement Type
Runways							
R1A	32	63	56	34	Poor	-22	AC
R2A	33	45	53	20	Very poor	-23	AC/PCC
R3A	46	44	50	15	Very poor	-35	AC
Taxiways							
T1B	7	80	66	13	Very poor	-53	AC
T2C	30	30	22	31	Poor	+9	AC
T3A	15	26	12	16	Very poor	+4	AC
T4A	52	41	27	30	Poor	+3	AC
T5A	37	20	10	3	Failed	-7	AC
T6B	39	23	17	14	Very poor	-3	AC
T7B	25	30	8	8	Failed	0	PCC
T8B	--[1]	100	--[2]	99	Excellent	--	AC
Aprons							
A1B	30	6	2	18	Very poor	+16	AC
A2B	10	10	7	30	Poor	+23	PCC
A3B	57	46	36	40	Poor	+4	PCC
A4B	24	20	11	32	Poor	+21	PCC
A5B	86	78	71	89	Excellent	+18	PCC
A6B	46	46	33	10	Failed	-23	PCC
A7B	[3]	62	59	76	Very Good	-17	PCC
A8B	17	16	8	14	Very poor	+6	PCC
A9B	[1]	100	96	96	Excellent	0	PCC

[1] Under constructed at the time of the 1987 survey.
[2] Surveyed as part of T1B prior to 2002.
[3] Not surveyed prior to 1987.

Photo C1. Runway 4-22, Feature R1A, medium-severity shattered slab

Photo C2. Runway 4-22, Feature R2A, medium-severity longitudinal crack

Photo C3. Runway 4-22, Feature R3A, medium-severity joint spall

Photo C4. Taxiway A-5, Feature T2C, high-severity shattered slab

Photo C5. Taxiway B, Feature T7B, vegetation in shattered slab

Photo C6. Apron 1, Feature A1B, filled cracks

Photo C7. Apron 2, Feature A3B, high-severity D cracking

Photo C8. Apron 2, Feature A4B high-severity settlement

Photo C9. Apron 4, Feature A6B, high-severity alligator cracking

Photo C10. South Apron, Feature A9B, low-severity small patch

Appendix D Structural Analyses

General

The performance of the airfield pavement facilities was analyzed for either the mixture of traffic shown in Table A4 or for specific aircraft traffic based on usage.

The airfield was evaluated as a Class III airfield in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). The traffic mix established for this airfield listed in Table A4 was converted to equivalent traffic of the critical aircraft based on the procedure outlined in TM 5-825-2/DM 21.3/AFM 88-6, Chapter 2 (Headquarters, Departments of the Army, the Air Force, and the Navy 1978). The critical aircraft is defined as that aircraft within a mixture of various aircraft operating at a facility that will impose a more severe combination of gear load and tire pressure than the other assigned aircraft at their respective pass levels. For the projected aircraft traffic mixture, the critical aircraft within the mixture was determined and the number of passes of the critical aircraft required to produce an effect on the pavement equivalent to the total mixture of traffic was computed. The critical aircraft operating on the PCC and AC primary pavements was determined to be the CH-47 at a design pass level of 14,207 passes. Table D1 presents the critical aircraft computation results for the airfield.

The operational ACN values determined for the critical aircraft (23 Mg (50-kip)) CH-47 aircraft are shown in Table D2 for the four subgrade strength categories.

In a wartime scenario, aircraft may be required to operate at weights that exceed normal peacetime loads. These aircraft would have a higher ACN, would cause more damage, and reduce the life of the pavement. A mobilization ACN can be determined from the appropriate ACN-PCN curve presented in ETL 1110-3-394 (Headquarters, Department of the Army 1991). A typical ACN-PCN curves for the CH-47 is shown in Figure D1. For contingency planning, it is often necessary to determine the largest aircraft that can safely land on an airfield. Runway length is a critical factor in this determination. Minimum take-off distances for maximum take-off weights of aircraft are also given in ETL 1110-3-394 (Headquarters, Department of the Army 1991). For a specified aircraft, the ACN can be determined from the ACN-PCN curve and then the effect of the higher loads on the airfield can be determined from the ACN/PCN ratio. Specific aircraft mobilization traffic requirements are contained in classified mobilization plans and are not included in this report.

ACN-PCN Method of Reporting Pavement Structural Condition

The ACN-PCN method is structured so that the structural evaluation of a pavement for a particular aircraft can be accomplished by using the ratio of the aircraft ACN to the pavement PCN. For a given pavement life and a given number of operations of a particular aircraft, there is a relationship between the ACN/PCN ratio and the percent of pavement life used by the applied traffic. For a given ACN/PCN ratio, a relationship exists for the number of operations that will produce failure of the pavement. These relationships provide a method for evaluating a pavement for allowable load depending on an acceptable degree of damage to the pavement or an allowable number of operations of a particular aircraft to cause failure of a pavement. For aircraft having an ACN equal to the PCN, the predicted failure of the pavement would equal the design life of the pavement. Aircraft having ACNs higher than the pavement PCN would overload the pavement and decrease the life of the pavement. Likewise if the ACN of the operational aircraft were less than the pavement PCN, the life of the pavement would be greater than the design life. If the operational ACN is greater than the pavement PCN and a decrease in pavement life is not acceptable, then structural improvement of the pavement is required to bring the pavement PCN up to or greater than the operational ACN.

PCN Analysis

Modulus values shown in Appendix B were input into the computerized Layered Elastic Evaluation Program (LEEP) to determine the load-carrying capacity of each pavement feature in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). Using the design aircraft and traffic levels for normal operations, a PCN was determined for each pavement feature. The PCN is determined using the allowable gross aircraft load and the subgrade strength category. To determine the subgrade category, back-calculated subgrade moduli were converted to CBR values using the correlation $E = 1500$ (CBR). Table D3 presents a summary of the evaluation of each pavement feature in terms of allowable gross aircraft loadings, PCN, and overlay thicknesses required to increase the structural capacity such that the mission traffic can be supported (PCN ≥ operational ACN). The Airfield Pavement Evaluation Chart (APEC) presented in Illustration 1 shows a layout of the airfield pavements and corresponding PCN for each facility.

The PCN codes and PCI for each feature were analyzed to establish ISR ratings listed in Table 3-1. An ISR Rating for each pavement facility is shown in

Illustration 2. AR 420-72 (Headquarters Department of the Army 2000) requires that the following ACN/PCN ratios be used in determining ISR ratings for airfield pavement facilities.

ACN/PCN ≤ 1.0 equals an ISR Green rating
1.0 < ACN/PCN ≤ 1.5 equals an ISR Amber rating
ACN/PCN > 1.5 equals an ISR Red rating

For those features having a PCN less than the required operational ACN, the additional pavement thickness (overlay) needed to support the mission traffic was computed. Although the required increase in pavement strength is presented as an overlay thickness, several other approaches could be considered. A detailed analysis will be required to select and design the most cost-effective repair or improvement alternative. It should be noted that although less than 102 mm (4-in.) -thick AC overlay requirements are indicated in Table D3, the following minimum thicknesses are recommended in UFC 3-260-2 (Headquarters, Departments of the Army, Navy, and the Air Force 2001):

a. 51 mm (2-in.) -thick minimum AC overlay over AC pavements.

b. 102 mm (4-in.) -thick minimum AC overlay over PCC pavements.

c. 152 mm (6-in.) -thick minimum PCC partially or nonbonded overlay.

d. 51 mm (2-in.) -thick minimum PCC fully bonded overlay over PCC pavements.

These minimum overlay requirements are required to control the degree of cracking which will occur in the base pavement (existing pavement) due to the application of the design traffic. If those features needing structural improvements are not upgraded in a timely manner pavement may deteriorate rapidly and result in damage to all pavement layers and an increase in cost for the necessary improvements. Excessive damage may also result in lengthy closures of the pavement facility.

The PCN codes for the weakest feature within each pavement facility are shown in Table D4. The PCN code includes the PCN numerical value, pavement type, subgrade category, allowable tire pressure, and method used to determine the PCN. An example of a PCN code is: 30/F/A/W/T, with 30 expressing the numerical PCN value, F indicating a flexible pavement, A indicating high strength subgrade, W indicating high-allowable tire pressure, and T indicating that the PCN value was obtained by a technical evaluation. Table D5 presents a description of the letter codes comprising the PCN code. Each PCN assumes that only the design aircraft will be used for the stated number of passes. Theoretically, if the PCN is equal to the ACN, the pavement should perform satisfactorily and require only routine maintenance through the length of the analysis period. There may be situations when it is necessary to overload a pavement, i.e., the ACN is greater than the PCN. Examples are emergency landings, short-term contingencies, exercises, and air shows. Pavements can usually support some overload; however, pavement life can be reduced. If the PCN were less than the

ACN, the ACN/PCN ratio would be greater than 1 and the pavement would be expected to fail before reaching the end of the analysis period. As a general rule, ACN/PCN ratios of up to 1.25 have minimal impact on pavement life. If the ACN/PCN ratio is between 1.25 and 1.50, aircraft operations should be limited to 10 passes and the pavement inspected after each operation. Aircraft operations resulting in an ACN/PCN ratio over 1.50 should not be allowed except for emergencies. An example of how to use the ACP/PCN method to determine if an aircraft will overload a pavement is shown below.

Example Problem

Runway 4-22, Taxiway A, Apron 3 must be used for 1,000 passes of a C-23 aircraft operating at a take-off weight of 11 168 kg (24,600 lb). Find the weakest features on each facility and determine if they can support this traffic?

Solution

From Table D3, determine the weakest feature on R/W 4-22, Taxiway A and E, and the Apron 3; from Figure D1 determine the ACN of a 11 168 kg (24,600 lb) C-23, and then calculate the ACN/PCN ratio using the appropriate PCN from Table D3.

a. *Runway 4-22.*

Weakest feature is R2A (see Table D3)
PCN for R2A = 5/R/D/W/T
ACN for a 11 168 kg (24,600 lb) C-23 on an ultra-low strength subgrade = 8/R/D/W/T (see Figure D2).
ACN/PCN ratio is 8/5 or 1.6; therefore R2A should be limited to emergency C-23 traffic.

b. *Taxiway A.*

Weakest feature is T3A (see Table D3)
PCN for T3A = 5/R/D/W/T
ACN for a 11 168 kg (24,600 lb) C-23 on an ultra-low strength subgrade = 8/R/D/W/T (see Figure D2).
ACN/PCN ratio is 8/5 or 1.6; therefore T3A should be limited to emergency C-23 traffic.

c. *Apron 3 (A5B).*

PCN for A5B = 24/R/C/W/T
ACN for a C-23 on a low strength subgrade = 8/D/C/W/T (see Figure D2).
ACN/PCN ratio is 8/24 or 0.33; therefore A5B should perform satisfactorily.

A summary of the evaluation of each pavement facility in terms of PCN for the thaw-weakened period (November-March) is shown in Table D4. See Table D3 for a summary of the evaluation during the thaw-weakened period for each pavement feature in terms of allowable gross aircraft loadings, PCN, and overlay thicknesses required to increase the structural capacity such that the mission traffic can be supported (PCN $\geq$ operational ACN). When a pavement is not properly designed and constructed to withstand the detrimental effects of winter, one or both of the following will occur: nonuniform heave due to ice lenses or loss of strength during a thaw period. Thaw-weakened periods, which generally occur during the time period of November through March, are identified based on the climatological data shown in Table A1. During this period, several to many cycles of freezing and thawing will occur. Loss of strength will take place during thaw periods in those pavements that have not been properly designed and constructed to prevent such loss. The degree of strength loss depends upon the depth of frost and subsequent thawing. The depth of frost penetration (22-in.) was determined from the climatological data summarized for MAFF. Typical soils in the area are high frost susceptible (frost codes are an F-3). PCNs for the thaw-weakened periods are provided as guidance to the airfield operator for managing airfield operations during the December through February time frame.

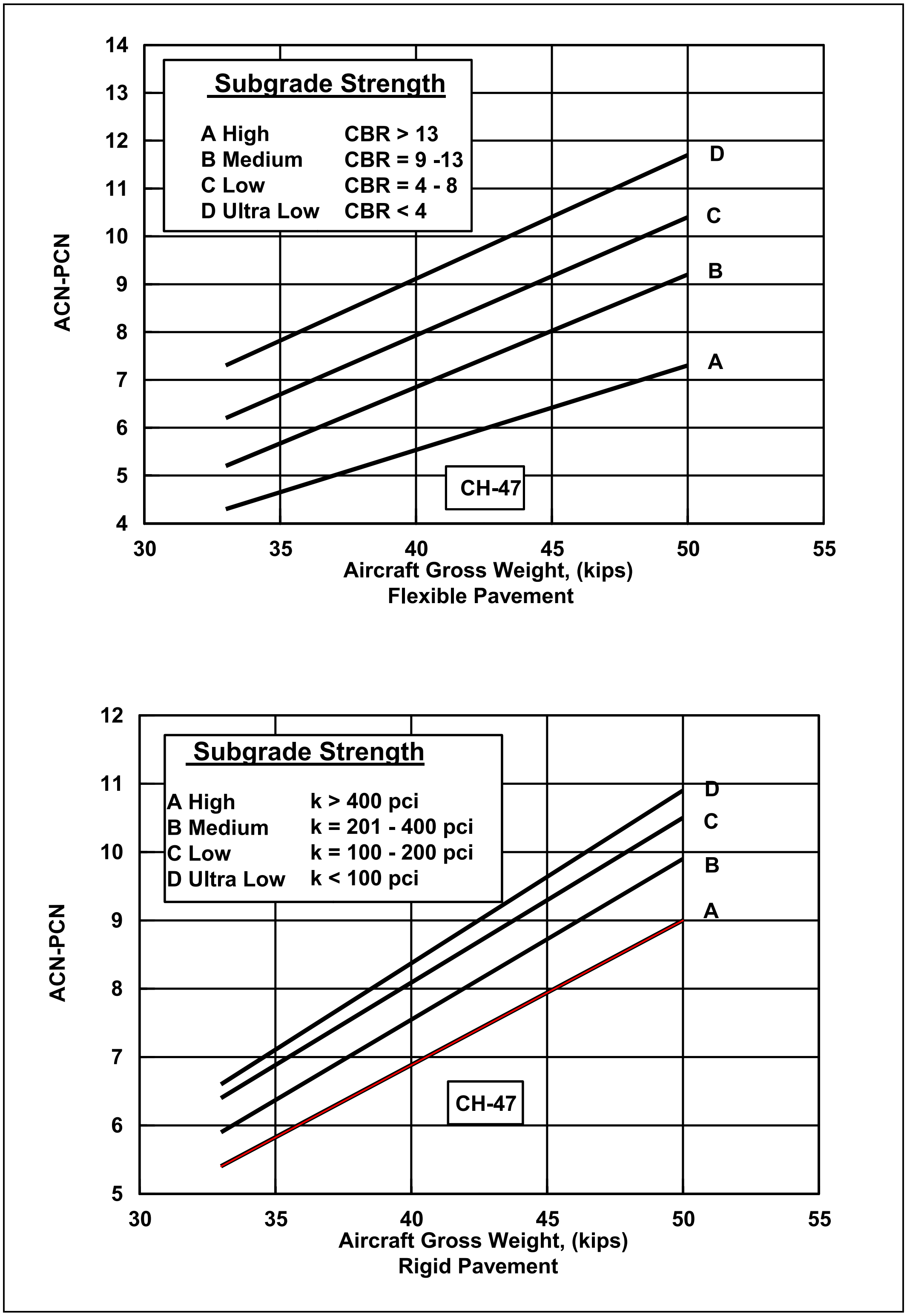

Figure D1. ACN-PCN curve for a CH-47

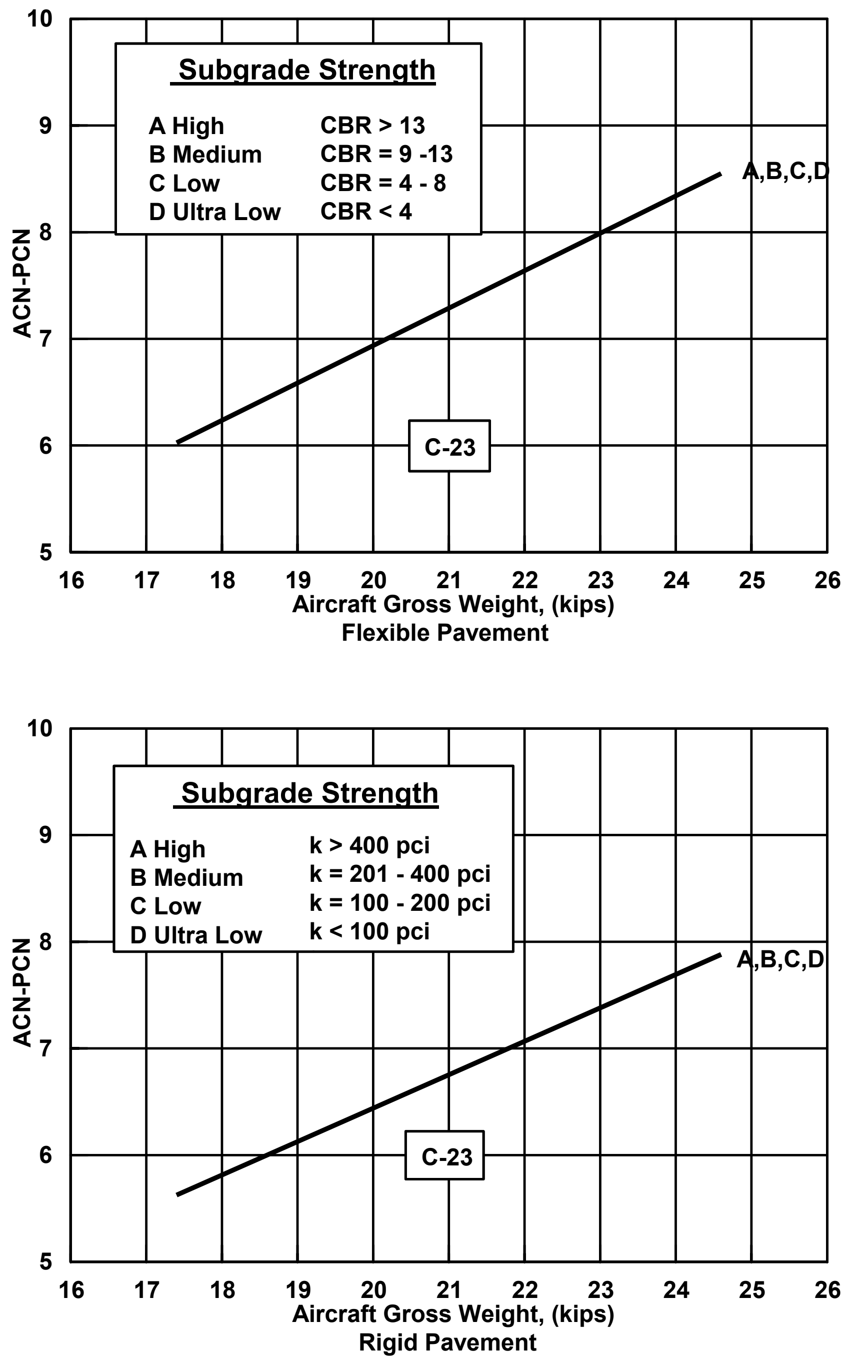

Figure D2. ACN-PCN curve for a C-23

Table D1
Determination of Critical Aircraft and Design Traffic

Fixed-Wing Aircraft	Gross Weight kg (lb)	20-year Projected Aircraft Passes	20-year Equivalent CH-47 Passes
C-23	11 168 (24,600)	50,000	4,207
CH-47	22 700 (50,000)	10,000	10,000
20-year Total Equivalent CH-47 passes @ 22 700 (50,000) = 14,207			

Table D2
Determination of ACN Values for the Critical Aircraft

Design Aircraft	Weight kg (lb)	Subgrade Category[1]	ACN or Required PCN
PCC Pavements			
CH-47	22 700 (50,000)	A	9
		B	10
		C	11
		D	11
AC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
CH-47	70 300 (150,000)	A	7
		B	9
		C	10
		D	12

[1] See Table D6 for subgrade category.

Table D3
Allowable Gross Aircraft Loads and Overlay Requirements for the Projected Day-To-Day Traffic

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2] Aircraft	Weight Kg (lb)	Passes	ACN	Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.) AC	PCC Partial Bond	PCC No Bond
Runway 4-22	R1A	0+00-3+05 (0+00-10+00)	A	26 (96)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.2)	6/R/D/W/T	343 (13.5)	188 (7.4)	208 (8.2)
	R2A	3+05-10+67 (10+00-35+00)	A	25 (91)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (27.6)	5/R/D/W/T	389 (15.3)	201 (7.9)	216 (8.5)
	R3A	10+67-13+72 (35+00-45+00)	A	26 (95)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.1)	6/R/D/W/T	378 (14.9)	198 (7.8)	213 (8.4)
Taxiway A-5	T1B	0+00-0+67 (0+00-2+20)	B	19 (68)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	12 (27.2)	5/R/D/W/T	396 (15.6)	201 (7.9)	216 (8.5)
	T2C	0+00-1+29 (0+00-4+24)	C	22 (84)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	17 (38.1)	8/R/D/W/T	206 (8.1)	137 (5.4)	157 (6.2)
Taxiway A	T3A	0+00-7+28 (0+00-23+90)	A	28 (102)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.6)	5/R/D/W/T	338 (13.3)	188 (7.4)	206 (8.1)
Taxiway A-2	T4A	0+00-2+74 (0+00-9+00)	A	26 (97)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.2)	6/R/D/W/T	333 (13.1)	185 (7.3)	206 (8.1)
	T5A	0+00-2+44 (0+00-8+00)	A	26 (96)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.2)	6/R/D/W/T	378 (14.9)	198 (7.8)	213 (8.4)
Taxiway A-1	T6B	1+46-12+46 (0+00-20+36)	B	23 (86)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.7)	6/R/D/W/T	363 (14.3)	193 (7.6)	208 (8.2)
Taxiway B	T7B	12+46-16+08 (40+88-52+75)	B	20 (75)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (27.8)	6/R/D/W/T	383 (15.1)	198 (7.8)	213 (8.4)
Taxiway B-3	T8B	0+67-1+29 (2+20-4+24)	B	41 (149)	CH-47	22 700 (50,000)	14,207	11/R/C/W/T	23 (50+)[3]	17/R/C/W/T	0 (0.0)	0 (0.0)	0 (0.0)
Apron 1	A1B	1-6	B	22 (82)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	16 (35.7)	7/R/D/W/T	287 (11.3)	163 (6.4)	175 (6.9)

(Sheet 1 of 2)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.

Table D3 (Concluded)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2] Aircraft	Weight Kg (lb)	Passes	ACN	Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.) AC	PCC Partial Bond	PCC No Bond
Fixed-wing Pavements													
Apron 1	A2B	1-8	B	25 (93)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (29.3)	6/R/D/W/T	353 (13.9)	191 (7.5)	206 (8.1)
Apron 2	A3B	1-21	B	21 (78)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.0)	6/R/D/W/T	229 (9.0)	162 (6.4)	193 (7.6)
	A4B	1-16	B	24 (89)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (29.0)	6/R/D/W/T	338 (12.6)	188 (7.2)	206 (8.0)
Apron 3	A5B	1-8	B	31 (114)	CH-47	22 700 (50,000)	14,207	11/R/C/W/T	23 (50+)[3]	24/R/C/W/T	0 (0.0)	0 (0.0)	0 (0.0)
Apron 4	A6B[4]	1-10	B	2	CH-47	22 700 (50,000)	14,207	12/F/D/W/T	15 (32.1)	7/F/D/W/T	23 (0.9)	NA[5]	NA[5]
Tie Down Area Helipad	A7B	1-4	B	20 (72)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	12 (40.3)	9/R/D/W/T	10 (0.4)	94 (3.7)	135 (5.3)
Taxiway B-3	A8B	1-6	B	24 (87)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (28.9)	6/R/D/W/T	361 (14.2)	193 (7.6)	208 (8.2)
South Apron	A9B	1-39	B	39 (143)	CH-47	22 700 (50,000)	14,207	11/R/C/W/T	23 (50+)[3]	17/R/C/W/T	0 (0.0)	0 (0.0)	0 (0.0)

(Sheet 2 of 2)

1 Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
2 Determined for the critical aircraft (see Table D1).
3 The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
4 Used LOW (Low Volume Evaluation Program) to compute subgrade CBR and used APE (Airfield Pavement Evaluation Program) to evaluate pavement.
5 Was not calculated because feature was evaluated as a flexible pavement.

Table D4
Allowable Gross Aircraft Loads and Overlay Requirements for the Projected Day-To-Day Traffic during the Frost Period (November –March)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2] Aircraft	Weight Kg (lb)	Passes	ACN	Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.) AC	PCC Partial Bond	PCC No Bond
Runway 4-22	R1A	0+00-3+05 (0+00-10+00)	A	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.3)	4/R/D/W/T	437 (17.2)	201 (7.9)	221 (8.7)
	R2A	3+05-10+67 (10+00-35+00)	A	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.1)	4/R/D/W/T	478 (18.8)	211 (8.3)	226 (8.9)
	R3A	10+67-13+72 (35+00-45+00)	A	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.3)	4/R/D/W/T	472 (18.6)	211 (8.3)	226 (8.9)
Taxiway A-5	T1B	0+00-0+67 (0+00-2+20)	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.3)	4/R/D/W/T	465 (18.3)	208 (8.2)	224 (8.8)
	T2C	0+00-1+29 (0+00-4+24)	C	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	13 (29.3)	6/R/D/W/T	279 (11.0)	147 (5.8)	168 (6.6)
Taxiway A	T3A	0+00-7+28 (0+00-23+90)	A	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.5)	4/R/D/W/T	437 (17.2)	201 (7.9)	218 (8.6)
Taxiway A-2	T4A	0+00-2+74 (0+00-9+00)	A	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.4)	4/R/D/W/T	424 (16.7)	198 (7.8)	218 (8.6)
	T5A	0+00-2+44 (0+00-8+00)	A	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.4)	4/R/D/W/T	470 (18.5)	211 (8.3)	226 (8.9)
Taxiway A-1	T6B	1+46-12+46 (0+00-20+36)	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (22.1)	4/R/D/W/T	447 (17.6)	201 (7.9)	216 (8.5)
Taxiway B	T7B	12+46-16+08 (40+88-52+75)	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.8)	4/R/D/W/T	455 (17.9)	206 (8.1)	221 (8.7)
Taxiway B-3	T8B	0+67-1+29 (2+20-4+24)	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/C/W/T	23 (50+)[3]	12/R/C/W/T	0 (0.0)	0 (0.0)	0 (0.0)
Apron 1	A1B	1-6	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	12 (27.5)	5/R/D/W/T	361 (14.2)	170 (6.7)	185 (7.3)

(Sheet 1 of 2)

[1] Values for a (F3) frost code subgrade.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.

Table D4 (Concluded)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2] Aircraft	Weight Kg (lb)	Passes	ACN	Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.) AC	PCC Partial Bond	PCC No Bond
Fixed-wing Pavements													
Apron 1	A2B	1-8	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (22.3)	4/R/D/W/T	445 (17.5)	201 (7.9)	216 (8.5)
Apron 2	A3B	1-21	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (21.8)	4/R/D/W/T	302 (11.9)	170 (6.7)	201 (7.9)
	A4B	1-16	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (22.2)	4/R/D/W/T	409 (16.1)	193 (7.6)	211 (8.3)
Apron 3	A5B	1-8	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/C/W/T	23 (50+)[3]	20/R/D/W/T	0 (0.0)	0 (0.0)	0 (0.0)
Apron 4	A6B[4]	1-10	B	2	CH-47	22 700 (50,000)	14,207	12/F/D/W/T	15 (32.1)	7/F/D/W/T	23 (0.9)	NA[4]	NA[4]
Tie Down Area Helipad	A7B	1-4	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	15 (33.5)	7/R/D/W/T	79 (3.1)	104 (4.1)	147 (5.8)
Taxiway B-3	A8B	1-6	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/D/W/T	10 (22.1)	4/R/D/W/T	447 (17.6)	203 (8.0)	218 (8.6)
South Apron	A9B	1-39	B	7 (25)	CH-47	22 700 (50,000)	14,207	11/R/C/W/T	23 (50+)[3]	13/R/DW/T	0 (0.0)	0 (0.0)	0 (0.0)

(Sheet 2 of 2)

[1] Values for a (F3) frost code subgrade.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D5
Summary of Pavement Classification Numbers

Pavement Facility	Controlling Feature	PCN[1] Code, Normal Nonfrost	PCN[1] Code, Thaw-weakened
Runway 4-22	R2A	5/R/D/W/T	4/R/D/W/T
Taxiway A-5	T1B	5/R/D/W/T	4/R/D/W/T
Taxiway A	T3A	5/R/D/W/T	4/R/D/W/T
Taxiway A-2	T4A	6/R/D/W/T	4/R/D/W/T
Taxiway A-1	T6B	6/R/D/W/T	4/R/D/W/T
Taxiway B	T7B	6/R/D/W/T	4/R/D/W/T
Apron 1	A2B	6/R/D/W/T	4/R/D/W/T
Apron 2	A3B	6/R/D/W/T	4/R/D/W/T
Apron 3	A5B	24/R/C/W/T	20/R/D/W/T
Apron 4	A6B	7/F/D/W/T	7/F/D/W/T
Tie Down Area Helipads	A7B	9/R/D/W/T	7/R/D/W/T
Compass Swing Base	A8B	6/R/D/W/T	4/R/D/W/T
South Apron	A9B	16/R/C/W/T	13/R/D/W/T

[1] Table D6 describes the components of the PCN code.

Table D6
PCN Five-Part Code

PCN	Pavement Type	Subgrade Strength[1]	Tire Pressure2	Method of PCN Determination
Numerical value	R - rigid	A	W	T - technical evaluation
	F - flexible	B	X	U - using aircraft
		C	Y	
		D	Z	

[1]Code	Category	Flexible Pavement CBR, %	Rigid Pavement K, kPa/mm, (psi/in.)
A	High	≥ 13	≥ 108 (400)
B	Medium	13 > CBR ≥ 8	108 > K ≥ 54 (400 > K ≥ 200)
C	Low	8 > CBR ≥ 4	54 > K ≥ 27 (200 > K ≥ 100)
D	Ultra-low	< 4	< 27 (< 100)

[2]Code	Category	Tire Pressure, MPa (psi)
W	High	No limit
X	Medium	1.0 - 1.5 (146 - 217)
Y	Low	0.51 - 1.0 (73 - 145)
Z	Ultra-low	0 - 0.5 (0 - 72)

Appendix E
Micro Paver Output Summary

```
Network ID      - MARSH
Branch Name     - RUNWAY 4-22                 Slab Length     -    20.00 LF
Branch Number   - R1A                         Slab Width      -    12.50 LF
Section Number  - 1    Family - DEFAULT       Number of Slabs -    600
===========================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  -------------------------------------------------------------------------
  PCI OF SECTION =  34                                RATING = POOR

  TOTAL NUMBER OF SAMPLE UNITS =    30
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     = 16
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =  0
  RECOMMENDED MINIMUM OF    24 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  28.8%


       *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW           11 (SLABS)        1.79        1.80
  62 CORNER BREAK   MEDIUM         2 (SLABS)        1.00        1.50
  63 LINEAR CR      LOW          105 (SLABS)       17.56       12.66
  63 LINEAR CR      MEDIUM        55 (SLABS)        9.23       17.71
  63 LINEAR CR      HIGH          63 (SLABS)       10.42       26.19
  65 JT SEAL DAM    HIGH         600 (SLABS)      100.00       12.00
  71 FAULTING       MEDIUM         4 (SLABS)        1.00        2.00
  72 SHATTERED SLAB LOW            5 (SLABS)        1.00        2.50
  72 SHATTERED SLAB MEDIUM        32 (SLABS)        5.36       19.74
  72 SHATTERED SLAB HIGH          79 (SLABS)       13.10       43.92
  73 SHRINKAGE CR   N/A            9 (SLABS)        1.49        0.79
  74 JOINT SPALL    LOW           16 (SLABS)        2.68        1.67
  74 JOINT SPALL    MEDIUM         7 (SLABS)        1.19        1.58
  75 JOINT SPALL    HIGH           4 (SLABS)        1.00        3.00
  75 CORNER SPALL   LOW            4 (SLABS)        1.00        0.30
  75 CORNER SPALL   MEDIUM         4 (SLABS)        1.00        0.80


    *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  85.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   8.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   7.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - MARSH
Branch Name     - RUNWAY 4-22                   Slab Length     -     20.00 LF
Branch Number   - R2A                           Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT          Number of Slabs -   1410
===========================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  20                            RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =    68
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    23
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    24 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  15.6%


       *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW               6 (SLABS)       1.00           0.70
  62 CORNER BREAK   MEDIUM            9 (SLABS)       1.00           1.50
  62 CORNER BREAK   HIGH             15 (SLABS)       1.03           2.99
  63 LINEAR CR      LOW             128 (SLABS)       9.09           7.95
  63 LINEAR CR      MEDIUM          169 (SLABS)      11.98          20.95
  63 LINEAR CR      HIGH            294 (SLABS)      20.87          40.96
  65 JT SEAL DAM    LOW              70 (SLABS)       4.96           2.00
  65 JT SEAL DAM    HIGH           1340 (SLABS)      95.04          12.00
  66 SMALL PATCH    LOW               9 (SLABS)       1.00           0.15
  66 SMALL PATCH    MEDIUM            3 (SLABS)       1.00           0.60
  67 LARGE PATCH    LOW              17 (SLABS)       1.24           1.15
  67 LARGE PATCH    MEDIUM            6 (SLABS)       1.00           2.50
  72 SHATTERED SLAB LOW              15 (SLABS)       1.03           2.57
  72 SHATTERED SLAB MEDIUM           70 (SLABS)       4.96          18.93
  72 SHATTERED SLAB HIGH             93 (SLABS)       6.61          33.63
  73 SHRINKAGE CR   N/A              55 (SLABS)       3.93           0.95
  74 JOINT SPALL    LOW              15 (SLABS)       1.03           0.67
  74 JOINT SPALL    MEDIUM           17 (SLABS)       1.24           1.70
  74 JOINT SPALL    HIGH             52 (SLABS)       3.72          10.92
  75 CORNER SPALL   LOW              20 (SLABS)       1.45           0.64
  75 CORNER SPALL   MEDIUM            9 (SLABS)       1.00           0.80
  75 CORNER SPALL   HIGH             15 (SLABS)       1.03           1.35


     *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  79.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   8.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  13.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - RUNWAY 4-22                  Slab Length     -     20.00 LF
Branch Number    - R3A                          Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT        Number of Slabs -    600
==========================================================================

  ------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  15                              RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =    30
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    17
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    10 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   9.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              11 (SLABS)       1.76           1.78
  62 CORNER BREAK   MEDIUM            7 (SLABS)       1.18           1.56
  62 CORNER BREAK   HIGH              9 (SLABS)       1.47           3.55
  63 LINEAR CR      LOW              64 (SLABS)      10.59           8.95
  63 LINEAR CR      MEDIUM           76 (SLABS)      12.65          21.66
  63 LINEAR CR      HIGH            125 (SLABS)      20.88          40.98
  64 DURIBILITY CR  HIGH              2 (SLABS)       1.00           2.00
  65 JT SEAL DAM    LOW              35 (SLABS)       5.88           2.00
  65 JT SEAL DAM    HIGH            565 (SLABS)      94.12          12.00
  66 SMALL PATCH    MEDIUM            2 (SLABS)       1.00           0.60
  67 LARGE PATCH    LOW               2 (SLABS)       1.00           0.75
  67 LARGE PATCH    MEDIUM            5 (SLABS)       1.00           2.50
  72 SHATTERED SLAB LOW              19 (SLABS)       3.24           7.77
  72 SHATTERED SLAB MEDIUM           48 (SLABS)       7.94          24.29
  72 SHATTERED SLAB HIGH             51 (SLABS)       8.53          37.15
  73 SHRINKAGE CR   N/A              32 (SLABS)       5.29           1.10
  74 JOINT SPALL    LOW              11 (SLABS)       1.76           1.41
  74 JOINT SPALL    MEDIUM           16 (SLABS)       2.65           3.01
  74 JOINT SPALL    HIGH             11 (SLABS)       1.76           5.76
  75 CORNER SPALL   LOW               5 (SLABS)       1.00           0.30
  75 CORNER SPALL   MEDIUM            2 (SLABS)       1.00           0.80
  75 CORNER SPALL   HIGH              5 (SLABS)       1.00           1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  81.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   9.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  10.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - TAXIWAY A-5                  Slab Length     -     20.00 LF
Branch Number    - T1B                          Slab Width      -     12.50 LF
Section Number   - 1     Family - DEFAULT       Number of Slabs -     44
============================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  13                              RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =      2
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     2
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     2 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  15.0%


       *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              1 (SLABS)       2.27           2.09
  63 LINEAR CR      LOW              1 (SLABS)       2.27           2.37
  63 LINEAR CR      MEDIUM           8 (SLABS)      18.18          26.93
  63 LINEAR CR      HIGH             4 (SLABS)       9.09          23.89
  65 JT SEAL DAM    MEDIUM          44 (SLABS)     100.00           7.00
  67 LARGE PATCH    MEDIUM           1 (SLABS)       2.27           6.45
  72 SHATTERED SLAB LOW              3 (SLABS)       6.82          13.75
  72 SHATTERED SLAB MEDIUM           6 (SLABS)      13.64          31.97
  72 SHATTERED SLAB HIGH             9 (SLABS)      20.45          52.52
  73 SHRINKAGE CR   N/A              2 (SLABS)       4.55           1.02


    *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  92.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   4.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   4.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - MARSH
Branch Name     - TAXIWAY A-5                    Slab Length     -    17.75 LF
Branch Number   - T2C                            Slab Width      -    12.50 LF
Section Number  - 1    Family - DEFAULT           Number of Slabs -     96
===========================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  31                             RATING = POOR

  TOTAL NUMBER OF SAMPLE UNITS =      5
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  29.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              3 (SLABS)       3.13           2.57
  62 CORNER BREAK   MEDIUM           1 (SLABS)       1.04           1.49
  62 CORNER BREAK   HIGH             3 (SLABS)       3.13           8.11
  63 LINEAR CR      LOW             16 (SLABS)      16.67          12.25
  63 LINEAR CR      MEDIUM          12 (SLABS)      12.50          21.51
  63 LINEAR CR      HIGH             5 (SLABS)       5.21          16.42
  64 DURIBILITY CR  HIGH             5 (SLABS)       5.21          15.38
  65 JT SEAL DAM    MEDIUM          96 (SLABS)     100.00           7.00
  67 LARGE PATCH    LOW              4 (SLABS)       4.17           2.67
  71 FAULTING       MEDIUM           1 (SLABS)       1.04           2.14
  71 FAULTING       HIGH             1 (SLABS)       1.04           3.62
  72 SHATTERED SLAB LOW              0 (SLABS)       0.00           0.30
  72 SHATTERED SLAB MEDIUM           4 (SLABS)       4.17          17.19
  72 SHATTERED SLAB HIGH            13 (SLABS)      13.54          44.50
  73 SHRINKAGE CR   N/A             13 (SLABS)      13.54           1.93
  74 JOINT SPALL    LOW              3 (SLABS)       3.13           1.75
  74 JOINT SPALL    MEDIUM           3 (SLABS)       3.13           3.28
  75 CORNER SPALL   LOW              3 (SLABS)       3.13           1.18


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  76.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  14.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  10.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - TAXIWAY A                    Slab Length     -     20.00 LF
Branch Number    - T3A                          Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT        Number of Slabs -     460
==========================================================================

  ------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  16                             RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =    28
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    15
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     7 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   7.7%
```

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
62 CORNER BREAK	LOW	7 (SLABS)	1.62	1.67
62 CORNER BREAK	MEDIUM	6 (SLABS)	1.30	1.70
62 CORNER BREAK	HIGH	3 (SLABS)	1.00	3.00
63 LINEAR CR	LOW	51 (SLABS)	11.04	9.23
63 LINEAR CR	MEDIUM	51 (SLABS)	11.04	19.89
63 LINEAR CR	HIGH	3 (SLABS)	1.00	3.50
64 DURABILITY CR	LOW	7 (SLABS)	1.62	1.23
64 DURABILITY CR	MEDIUM	9 (SLABS)	1.95	3.58
64 DURIBILITY CR	HIGH	37 (SLABS)	8.12	21.70
65 JT SEAL DAM	LOW	30 (SLABS)	6.49	2.00
65 JT SEAL DAM	MEDIUM	430 (SLABS)	93.51	7.00
66 SMALL PATCH	LOW	19 (SLABS)	4.22	0.47
67 LARGE PATCH	LOW	9 (SLABS)	1.95	1.66
67 LARGE PATCH	MEDIUM	3 (SLABS)	1.00	2.50
67 LARGE PATCH	HIGH	1 (SLABS)	1.00	4.00
70 SCALING	MEDIUM	6 (SLABS)	1.30	2.32
71 FAULTING	MEDIUM	6 (SLABS)	1.30	2.89
72 SHATTERED SLAB	LOW	27 (SLABS)	5.84	12.35
72 SHATTERED SLAB	MEDIUM	28 (SLABS)	6.17	21.29
72 SHATTERED SLAB	HIGH	93 (SLABS)	20.13	52.17
73 SHRINKAGE CR	N/A	6 (SLABS)	1.30	0.77
74 JOINT SPALL	LOW	10 (SLABS)	2.27	1.58
74 JOINT SPALL	MEDIUM	10 (SLABS)	2.27	2.80
74 JOINT SPALL	HIGH	4 (SLABS)	1.00	3.00
75 CORNER SPALL	LOW	12 (SLABS)	2.60	1.02
75 CORNER SPALL	MEDIUM	10 (SLABS)	2.27	1.52

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD	RELATED DISTRESSES =	68.00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY	RELATED DISTRESSES =	19.00 PERCENT DEDUCT VALUES.
OTHER	RELATED DISTRESSES =	13.00 PERCENT DEDUCT VALUES.

```
Network ID       - MARSH
Branch Name      - TAXIWAY A-2                    Slab Length     -    20.00 LF
Branch Number    - T4A                            Slab Width      -    12.50 LF
Section Number   - 1    Family - DEFAULT          Number of Slabs -    180
==========================================================================

  ------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  30                             RATING = POOR

  TOTAL NUMBER OF SAMPLE UNITS =    12
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     7
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     9 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  16.4%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              2 (SLABS)       1.35           1.40
  62 CORNER BREAK   MEDIUM           1 (SLABS)       1.00           1.50
  62 CORNER BREAK   HIGH             1 (SLABS)       1.00           3.00
  63 LINEAR CR      LOW             12 (SLABS)       6.76           6.22
  63 LINEAR CR      MEDIUM           7 (SLABS)       4.05           9.98
  64 DURABILITY CR  LOW              6 (SLABS)       3.38           1.36
  64 DURIBILITY CR  HIGH             4 (SLABS)       2.03           5.49
  65 JT SEAL DAM    MEDIUM         180 (SLABS)     100.00           7.00
  71 FAULTING       LOW              1 (SLABS)       1.00           1.00
  71 FAULTING       HIGH             2 (SLABS)       1.35           3.02
  72 SHATTERED SLAB LOW              1 (SLABS)       1.00           2.50
  72 SHATTERED SLAB MEDIUM           4 (SLABS)       2.03          10.82
  72 SHATTERED SLAB HIGH            35 (SLABS)      19.59          51.60
  73 SHRINKAGE CR   N/A              4 (SLABS)       2.03           0.80
  74 JOINT SPALL    LOW              1 (SLABS)       1.00           0.60
  74 JOINT SPALL    MEDIUM           4 (SLABS)       2.03           2.63
  75 CORNER SPALL   LOW              4 (SLABS)       2.03           0.85
  75 CORNER SPALL   MEDIUM           2 (SLABS)       1.35           0.94
  75 CORNER SPALL   HIGH             1 (SLABS)       1.00           1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  78.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  12.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  10.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - TAXIWAY A-2                  Slab Length     -     20.00 LF
Branch Number    - T5A                          Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT        Number of Slabs -    160
===========================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =   3                             RATING = FAILED

  TOTAL NUMBER OF SAMPLE UNITS =     8
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     6
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   4.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              4 (SLABS)       2.50            2.21
  62 CORNER BREAK   MEDIUM           3 (SLABS)       1.67            2.35
  62 CORNER BREAK   HIGH             7 (SLABS)       4.17           10.83
  63 LINEAR CR      LOW              8 (SLABS)       5.00            4.77
  63 LINEAR CR      MEDIUM          31 (SLABS)      19.17           27.76
  63 LINEAR CR      HIGH            15 (SLABS)       9.17           24.02
  64 DURABILITY CR  LOW              4 (SLABS)       2.50            1.32
  64 DURABILITY CR  MEDIUM           9 (SLABS)       5.83            7.64
  64 DURIBILITY CR  HIGH            48 (SLABS)      30.00           54.45
  65 JT SEAL DAM    MEDIUM         107 (SLABS)      66.67            7.00
  65 JT SEAL DAM    HIGH            53 (SLABS)      33.33           12.00
  66 SMALL PATCH    LOW              8 (SLABS)       5.00            0.52
  67 LARGE PATCH    LOW              9 (SLABS)       5.83            3.55
  71 FAULTING       LOW              1 (SLABS)       1.00            1.00
  72 SHATTERED SLAB LOW              1 (SLABS)       1.00            2.50
  72 SHATTERED SLAB MEDIUM          11 (SLABS)       6.67           22.17
  72 SHATTERED SLAB HIGH            24 (SLABS)      15.00           46.34
  73 SHRINKAGE CR   N/A              3 (SLABS)       1.67            0.80
  74 JOINT SPALL    LOW              3 (SLABS)       1.67            1.36
  75 CORNER SPALL   LOW              1 (SLABS)       1.00            0.30
  75 CORNER SPALL   MEDIUM           3 (SLABS)       1.67            1.11
  75 CORNER SPALL   HIGH             4 (SLABS)       2.50            3.31


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  60.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  35.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   5.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - TAXIWAY A-1                 Slab Length     -    20.00 LF
Branch Number    - T6B                         Slab Width      -    12.50 LF
Section Number   - 1    Family - DEFAULT        Number of Slabs -    407
===========================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  14                              RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =    23
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    14
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    11 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  12.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              4 (SLABS)       1.04            0.82
  62 CORNER BREAK   MEDIUM           1 (SLABS)       1.00            1.50
  62 CORNER BREAK   HIGH             3 (SLABS)       1.00            3.00
  63 LINEAR CR      LOW             14 (SLABS)       3.47            3.43
  63 LINEAR CR      MEDIUM          79 (SLABS)      19.44           27.99
  63 LINEAR CR      HIGH            10 (SLABS)       2.43           10.15
  64 DURABILITY CR  LOW              3 (SLABS)       1.00            0.50
  64 DURABILITY CR  MEDIUM          18 (SLABS)       4.51            6.21
  64 DURIBILITY CR  HIGH            28 (SLABS)       6.94           19.29
  65 JT SEAL DAM    HIGH           407 (SLABS)     100.00           12.30
  72 SHATTERED SLAB LOW             17 (SLABS)       4.17            9.58
  72 SHATTERED SLAB MEDIUM          21 (SLABS)       5.21           19.45
  72 SHATTERED SLAB HIGH            85 (SLABS)      20.83           52.91
  73 SHRINKAGE CR   N/A             10 (SLABS)       2.43            0.81
  74 JOINT SPALL    LOW              4 (SLABS)       1.04            0.69
  74 JOINT SPALL    MEDIUM           8 (SLABS)       2.08            2.67
  74 JOINT SPALL    HIGH             6 (SLABS)       1.39            4.49
  75 CORNER SPALL   LOW              3 (SLABS)       1.00            0.30
  75 CORNER SPALL   HIGH             1 (SLABS)       1.00            1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  73.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  21.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   6.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - TAXIWAY B (RW 18-36)       Slab Length      -     20.00 LF
Branch Number    - T7B                        Slab Width       -     12.50 LF
Section Number   - 1    Family - DEFAULT       Number of Slabs -    782
===========================================================================

  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:        Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =   8                               RATING = FAILED

  TOTAL NUMBER OF SAMPLE UNITS =    38
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    19
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     9 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   9.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              8 (SLABS)       1.05           0.85
  62 CORNER BREAK   MEDIUM           8 (SLABS)       1.05           1.49
  63 LINEAR CR      LOW             99 (SLABS)      12.63          10.18
  63 LINEAR CR      MEDIUM         169 (SLABS)      21.58          29.67
  63 LINEAR CR      HIGH            41 (SLABS)       5.26          16.53
  65 JT SEAL DAM    LOW            782 (SLABS)     100.00           2.00
  66 SMALL PATCH    LOW              2 (SLABS)       1.00           0.15
  66 SMALL PATCH    MEDIUM           2 (SLABS)       1.00           0.60
  66 SMALL PATCH    HIGH             2 (SLABS)       1.00           2.00
  67 LARGE PATCH    LOW             16 (SLABS)       2.11           1.73
  71 FAULTING       MEDIUM           6 (SLABS)       1.00           2.00
  72 SHATTERED SLAB LOW             33 (SLABS)       4.21           9.66
  72 SHATTERED SLAB MEDIUM         130 (SLABS)      16.58          35.25
  72 SHATTERED SLAB HIGH           222 (SLABS)      28.42          60.22
  73 SHRINKAGE CR   N/A             43 (SLABS)       5.53           1.13
  74 JOINT SPALL    LOW              8 (SLABS)       1.05           0.71
  74 JOINT SPALL    MEDIUM           6 (SLABS)       1.00           1.00
  74 JOINT SPALL    HIGH             6 (SLABS)       1.00           3.00
  75 CORNER SPALL   LOW              2 (SLABS)       1.00           0.30
  75 CORNER SPALL   MEDIUM           2 (SLABS)       1.00           0.80
  75 CORNER SPALL   HIGH             2 (SLABS)       1.00           1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  91.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   1.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   8.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - MARSH
Branch Name     - TAXIWAY B-3                   Slab Length     -     12.50 LF
Branch Number   - T8B                           Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT          Number of Slabs -     65
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  ------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  99                            RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =      3
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =      3
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =      0
  RECOMMENDED MINIMUM OF     3 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   1.6%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  66 SMALL PATCH    LOW               1 (SLABS)       1.47           0.38
  67 LARGE PATCH    LOW               1 (SLABS)       1.47           1.38


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - APRON 1                          Slab Length     -     20.00 LF
Branch Number    - A1B                              Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT            Number of Slabs -    158
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  ------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:          Drainage Cond.:
  Shoulder Cond. :       Overall Cond.:                 F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  18                                 RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =      6
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  14.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW               3 (SLABS)       2.00           1.93
  63 LINEAR CR      LOW              36 (SLABS)      23.00          14.78
  63 LINEAR CR      MEDIUM           14 (SLABS)       9.00          17.42
  63 LINEAR CR      HIGH             17 (SLABS)      11.00          27.17
  66 SMALL PATCH    LOW              28 (SLABS)      18.00           2.34
  66 SMALL PATCH    MEDIUM            2 (SLABS)       1.00           0.60
  72 SHATTERED SLAB LOW              44 (SLABS)      28.00          31.44
  72 SHATTERED SLAB MEDIUM           33 (SLABS)      21.00          39.65
  72 SHATTERED SLAB HIGH              6 (SLABS)       4.00          27.41



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  98.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   2.00 PERCENT DEDUCT VALUES.
```

```
Network ID       - MARSH
Branch Name      - APRON 1                        Slab Length     -    40.00 LF
Branch Number    - A2B                            Slab Width      -    12.50 LF
Section Number   - 1    Family - DEFAULT          Number of Slabs -    118
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  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:        Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:                F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  30                                RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =     6
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  10.3%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW               4 (SLABS)       3.00            2.49
  63 LINEAR CR      LOW              34 (SLABS)      29.00           16.59
  63 LINEAR CR      MEDIUM            9 (SLABS)       8.00           16.11
  66 SMALL PATCH    LOW              52 (SLABS)      44.00            6.03
  67 LARGE PATCH    LOW               4 (SLABS)       3.00            2.12
  72 SHATTERED SLAB LOW              68 (SLABS)      58.00           45.17
  72 SHATTERED SLAB MEDIUM            1 (SLABS)       1.00            5.00
  72 SHATTERED SLAB HIGH              1 (SLABS)       1.00           12.00
  73 SHRINKAGE CR   N/A               5 (SLABS)       4.00            0.96



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  91.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   9.00 PERCENT DEDUCT VALUES.
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Network ID       - MARSH
Branch Name      - APRON 2                        Slab Length     -     20.00 LF
Branch Number    - A3B                            Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT          Number of Slabs -    621
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  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:        Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  40                               RATING = POOR

  TOTAL NUMBER OF SAMPLE UNITS =    41
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    19
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    27 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  22.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              19 (SLABS)       3.03           2.51
  62 CORNER BREAK   MEDIUM            2 (SLABS)       1.00           1.50
  62 CORNER BREAK   HIGH              6 (SLABS)       1.01           3.00
  63 LINEAR CR      LOW             147 (SLABS)      23.74          15.03
  63 LINEAR CR      MEDIUM           38 (SLABS)       6.06          13.33
  63 LINEAR CR      HIGH             17 (SLABS)       2.78          11.04
  64 DURABILITY CR  LOW              63 (SLABS)      10.10           3.31
  64 DURABILITY CR  MEDIUM           27 (SLABS)       4.29           5.98
  64 DURIBILITY CR  HIGH             35 (SLABS)       5.56          16.20
  65 JT SEAL DAM    LOW              31 (SLABS)       5.05           2.00
  65 JT SEAL DAM    HIGH            420 (SLABS)      67.68          12.00
  66 SMALL PATCH    LOW              35 (SLABS)       5.56           0.56
  66 SMALL PATCH    MEDIUM            2 (SLABS)       1.00           0.60
  67 LARGE PATCH    LOW              86 (SLABS)      13.89           7.71
  71 FAULTING       MEDIUM            5 (SLABS)       1.00           2.00
  71 FAULTING       HIGH              8 (SLABS)       1.26           4.31
  72 SHATTERED SLAB LOW               5 (SLABS)       1.00           2.50
  72 SHATTERED SLAB MEDIUM           14 (SLABS)       2.27          11.77
  72 SHATTERED SLAB HIGH             30 (SLABS)       4.80          29.58
  73 SHRINKAGE CR   N/A              11 (SLABS)       1.77           0.80
  74 JOINT SPALL    LOW              19 (SLABS)       3.03           1.74
  74 JOINT SPALL    MEDIUM           11 (SLABS)       1.77           2.43
  74 JOINT SPALL    HIGH              2 (SLABS)       1.00           3.00
  75 CORNER SPALL   LOW               9 (SLABS)       1.52           0.67
  75 CORNER SPALL   MEDIUM            2 (SLABS)       1.00           0.80
  75 CORNER SPALL   HIGH              2 (SLABS)       1.00           1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  58.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  25.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  17.00 PERCENT DEDUCT VALUES.
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Network ID       - MARSH
Branch Name      - APRON 2                         Slab Length     -    20.00 LF
Branch Number    - A4B                             Slab Width      -    12.50 LF
Section Number   - 1    Family - DEFAULT            Number of Slabs -    560
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  ------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  32                               RATING = POOR

  TOTAL NUMBER OF SAMPLE UNITS =    36
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    14
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    24 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  28.8%


       *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              28 (SLABS)       5.07           3.89
  62 CORNER BREAK   MEDIUM            4 (SLABS)       1.00           1.50
  63 LINEAR CR      LOW             205 (SLABS)      36.59          18.33
  63 LINEAR CR      MEDIUM          116 (SLABS)      20.65          28.96
  63 LINEAR CR      HIGH             18 (SLABS)       3.26          12.19
  65 JT SEAL DAM    HIGH            560 (SLABS)     100.00          12.00
  71 FAULTING       HIGH              6 (SLABS)       1.09           3.75
  72 SHATTERED SLAB LOW              34 (SLABS)       6.16          12.82
  72 SHATTERED SLAB MEDIUM           20 (SLABS)       3.62          15.87
  72 SHATTERED SLAB HIGH             14 (SLABS)       2.54          22.25
  73 SHRINKAGE CR   N/A              41 (SLABS)       2.54           1.64
  74 JOINT SPALL    LOW              14 (SLABS)       2.54           1.64
  74 JOINT SPALL    MEDIUM            6 (SLABS)       1.09           1.30
  74 JOINT SPALL    HIGH              2 (SLABS)       1.00           3.00
  75 CORNER SPALL   LOW               2 (SLABS)       1.00           0.30
  75 CORNER SPALL   HIGH              2 (SLABS)       1.00           1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  82.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   9.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   9.00 PERCENT DEDUCT VALUES.
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```
Network ID       - MARSH
Branch Name      - APRON 3                        Slab Length     -     20.00 LF
Branch Number    - A5B                            Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT          Number of Slabs -    443
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  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  89                               RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    18
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    16
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    24 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  28.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  63 LINEAR CR      LOW                2 (SLABS)       1.00           1.00
  66 SMALL PATCH    LOW               76 (SLABS)      17.08           2.19
  67 LARGE PATCH    LOW               30 (SLABS)       6.67           4.01
  67 LARGE PATCH    HIGH               2 (SLABS)       1.00           4.00
  74 JOINT SPALL    LOW                7 (SLABS)       1.67           1.36
  74 JOINT SPALL    HIGH               6 (SLABS)       1.25           3.98
  75 CORNER SPALL   LOW                4 (SLABS)       1.00           0.30
  75 CORNER SPALL   HIGH               2 (SLABS)       1.00           1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   6.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  94.00 PERCENT DEDUCT VALUES.
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```
Network ID      - MARSH
Branch Name     - APRON 4                     Section Length  -    433.00 LF
Branch Number   - A6B                         Section Width   -    380.00 LF
Section Number  - 1    Family - DEFAULT       Section Area    -  95967.00 SF
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  ----------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -----------------------------------------------------------------------

  PCI OF SECTION =  10                               RATING = FAILED

  TOTAL NUMBER OF SAMPLE UNITS =    14
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     9
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    15 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  12.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE
  41 ALLIGATOR CR   LOW            892.00 (SF)        0.93           19.81
  41 ALLIGATOR CR   MEDIUM        2319.00 (SF)        2.42           38.48
  43 BLOCK CR       MEDIUM       64230.00 (SF)       66.93           45.54
  43 BLOCK CR       HIGH         30655.00 (SF)       31.94           57.90
  49 OIL SPILLAGE   N/A            669.00 (SF)        0.70            3.24
  50 PATCHING       MEDIUM        1338.00 (SF)        1.39           10.64
  52 WEATH/RAVEL    LOW          11147.00 (SF)       11.62           10.59
  52 WEATH/RAVEL    MEDIUM       74129.00 (SF)       77.24           10.59
  52 WEATH/RAVEL    HIGH          2341.00 (SF)        2.44           29.34


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  22.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  77.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   1.00 PERCENT DEDUCT VALUES.
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Network ID       - MARSH
Branch Name      - PARKING PADS                Slab Length     -     20.00 LF
Branch Number    - A7B                         Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT        Number of Slabs -     70
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  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  76                         RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    5
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  11.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  63 LINEAR CR      LOW              29 (SLABS)      41.43         19.19
  67 LARGE PATCH    LOW               1 (SLABS)       1.43          1.34
  70 SCALING        LOW               3 (SLABS)       4.29          1.83
  70 SCALING        MEDIUM            3 (SLABS)       4.29          5.97
  73 SHRINKAGE CR   N/A               6 (SLABS)       8.57          1.43



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD              RELATED DISTRESSES =  64.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  OTHER             RELATED DISTRESSES =  36.00 PERCENT DEDUCT VALUES.
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Network ID       - MARSH
Branch Name      - COMPASS SWING BASE         Slab Length     -     20.00 LF
Branch Number    - A8B                        Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT      Number of Slabs -    160
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  -------------------------------------------------------------------------
  Inspection Date: MAY/21/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  -------------------------------------------------------------------------

  PCI OF SECTION =  14                             RATING = POOR

  TOTAL NUMBER OF SAMPLE UNITS =      7
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     7
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     7 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  10.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              4 (SLABS)       2.78           2.37
  62 CORNER BREAK   MEDIUM           4 (SLABS)       2.78           4.69
  63 LINEAR CR      LOW             24 (SLABS)      14.81          11.36
  63 LINEAR CR      MEDIUM          37 (SLABS)      23.15          30.84
  63 LINEAR CR      HIGH            12 (SLABS)       7.41          20.79
  64 DURABILITY CR  LOW              3 (SLABS)       1.85           1.28
  65 JT SEAL DAM    HIGH           160 (SLABS)     100.00          12.00
  67 LARGE PATCH    LOW              1 (SLABS)       1.00           0.75
  67 LARGE PATCH    HIGH             4 (SLABS)       2.78          11.10
  72 SHATTERED SLAB LOW             10 (SLABS)       6.48          13.28
  72 SHATTERED SLAB MEDIUM          10 (SLABS)       6.48          21.85
  72 SHATTERED SLAB HIGH            25 (SLABS)      15.74          47.24
  73 SHRINKAGE CR   N/A              4 (SLABS)       2.78           0.84
  74 JOINT SPALL    HIGH             1 (SLABS)       1.00           0.30
  75 CORNER SPALL   LOW              1 (SLABS)       1.00           0.30
  75 CORNER SPALL   MEDIUM           1 (SLABS)       1.00           0.80


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  84.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   7.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   9.00 PERCENT DEDUCT VALUES.
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Network ID       - MARSH
Branch Name      - SOUTH APRON                    Slab Length     -     12.50 LF
Branch Number    - A9B                            Slab Width      -     12.50 LF
Section Number   - 1    Family - DEFAULT          Number of Slabs -  10348
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  Inspection Date: MAY/21/2002
  Riding Quality :             Safety:        Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:                F.O.D.:
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  PCI OF SECTION =  96                               RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =   520
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    30
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF     5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   5.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE
  62 CORNER BREAK   LOW              34 (SLABS)       1.00           0.70
  63 LINEAR CR      LOW             121 (SLABS)       1.17           1.27
  66 SMALL PATCH    LOW             586 (SLABS)       5.67           1.27
  67 LARGE PATCH    LOW             172 (SLABS)       1.67           1.51
  73 SHRINKAGE CR   N/A              17 (SLABS)       1.00           0.60
  74 JOINT SPALL    LOW             172 (SLABS)       1.67           1.36
  75 CORNER SPALL   LOW              69 (SLABS)       1.00           0.30



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD              RELATED DISTRESSES =  31.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER             RELATED DISTRESSES =  69.00 PERCENT DEDUCT VALUES.
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13. SUPPLEMENTARY NOTES

14. ABSTRACT

An airfield pavement evaluation was performed in May 2002 at Marshall Army Airfield, Fort Riley, Kansas, to develop information pertaining to the structural adequacy of the airfield pavements for continued use under its current mission and the upgrading of the pavements for mission changes. The pavement surface condition was evaluated using the Pavement Condition Index (PCI) survey procedure, and a nondestructive evaluation procedure was used to determine the load-carrying capability of the pavements and overlay requirements for continued use of the pavements under current missions. Results of the evaluation are presented including: (a) a tabulation of the existing pavement features, (b) the results of the nondestructive tests performed using a heavy weight deflectometer, (c) the PCI and rating of the surface of each pavement feature, (d) a structural evaluation and overlay requirements for 14,207 passes of the CH-47 aircraft, (e) the pavement classification number for each pavement facility, and (f) maintenance and repair recommendations based on the structural evaluation and condition survey.

15. SUBJECT TERMS

Aircraft classification number	Nondestructive testing
Allowable gross aircraft load	Pavement classification number
Marshall Army Airfield	Pavement condition index

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